

**U. S. DEPARTMENT OF ENERGY
BROOKHAVEN NATIONAL LABORATORY**

**OPERABLE UNIT V
RECORD OF DECISION**

For

AOC 4 (Sewage Treatment Plant)

**Sub-AOC 4A (Sludge Drying Beds)
Sub-AOC 4B (Sand Filter Beds/Berms)
Sub-AOC 4C (Imhoff Tanks)
Sub-AOC 4D (Hold-up Ponds)
Sub-AOC 4E (Satellite Disposal Area)**

AOC 21 (Sewer Lines)

AOC 23 (Eastern Off-site Tritium Plume)

July 24, 2001

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U. S. DEPARTMENT OF ENERGY
BROOKHAVEN NATIONAL LABORATORY
RECORD OF DECISION

OPERABLE UNIT V

I. DECLARATION OF THE RECORD OF DECISION

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SITE NAME AND LOCATION

OPERABLE UNIT V
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK

STATEMENT OF BASIS AND PURPOSE

This Record of Decision presents the selected remedial actions for the portions of Operable Unit V (OU V) pertaining to the Sewage Treatment Plant, sewer lines, and groundwater at the Brookhaven National Laboratory (BNL) facility in Upton, New York. Operable Unit V is located in the northeast portion of the facility and also includes the Peconic River. The remedial action for the Peconic River portion of OU V will be addressed in a separate Record of Decision.

The remedial actions were selected in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (hereinafter jointly referred to as CERCLA), and is consistent, to the extent practicable, with the National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan). This decision is based on the Administrative Record for the BNL site.

The State of New York concurs with the selected remedial actions.

ASSESSMENT OF THE SITE

Actual or potential releases of hazardous substances, including chemical and radioactive materials, from these areas may present a threat to public health, welfare, or the environment if they are not addressed by implementing the response actions selected in this Record of Decision.

DESCRIPTION OF THE SELECTED REMEDY

Operable Unit V is one of six operable units at the BNL site. This Record of Decision addresses actions for the following Areas of Concern (AOCs): Sewage Treatment Plant (AOC 4), Sewer Lines (AOC 21), and Eastern Offsite Tritium Plume (AOC 23). In addition, a removal action conducted at the Imhoff Tanks (Sub-AOC 4C) is adopted as a final action. The remedial action decision for OU V Peconic River (AOC 30) is deferred for additional analysis and evaluation and will be documented in a separate Record of Decision. Remedies for other Operable Units are, or will be, selected in other Records of Decision. This Record of Decision documents remedies that are consistent with the overall site cleanup strategy for the BNL facility.

This Record of Decision includes a description of the principal contaminants and their representative risks. Cleanup goals have been established to meet regulatory standards. In the absence of Applicable or Relevant and Appropriate Requirements, risk based objectives based on current and future land uses were adopted and are included in this Record of Decision. The costs for each remedy have been estimated and are also included in this Record of Decision.

The major components of the selected remedy are:

- Sand Filter Beds and Berms (Sub-AOC 4B) and Sludge Drying Beds (Sub-AOC 4A) – A modified Scenario 2, excavation and off-site disposal of radiologically and chemically contaminated sand and soil above the selected cleanup goals, will be performed at the Sand Filter Beds and Berms and the Firing Range Berms and the Sludge Drying Beds. An As-Low-As-Reasonable-Achievable (ALARA) analysis will be included in the Remedial Action Work Plan to identify cost effective measures for further reducing exposure to residual contamination below cleanup goals. Techniques that minimize waste volumes or further stabilize wastes to meet disposal facility waste acceptance criteria may also be identified in the Remedial Action Work Plan. Post remediation sampling and dose assessments will be performed to ensure that cleanup goals are met for any remaining contaminants. Institutional controls will continue to ensure that planned uses remain protective of public health.
- Sewer Lines (AOC 21) – The current status of the sewer line (retired and capped at both ends) is such that no exposure pathway exists that could presently pose a risk to workers and the public. Removal of sludge from 10 manholes along the retired sewer line that lead to the Sewage Treatment Plant will be performed. Institutional controls will continue to ensure that planned uses remain protective of public health.
- Eastern Offsite Tritium Plume/Groundwater Monitoring (AOC 23) – Groundwater contaminated with low levels of volatile organic compounds (VOCs) and tritium associated with this AOC will be monitored. Low levels of VOCs, primarily trichloroethene (TCE) were detected in groundwater both on and off the BNL property. The maximum TCE levels (drinking water standard or Maximum Contaminant Level is 5 µg/l) detected on and off site during the remedial investigation were 32 µg/l and 8 µg/l, respectively (IT, 1998a). The previous maximum off-site TCE level was 12 µg/l. Tritium was also found during the remediation investigation with maximum levels of about 2,000 picoCuries per liter (pCi/l) which is one-tenth of the drinking water standard of 20,000 pCi/l. The previous maximum off-site tritium level reported was 7,240 pCi/l. Groundwater monitoring of VOC and tritium over time shows no indication of concentrations increasing in magnitude. The maximum TCE levels detected on and off the BNL property in 2000 were 17.9 µg/l and 10.7 µg/l, respectively. The maximum tritium levels detected on and off site in 2000 remain at less than one-tenth of the drinking water standard.
- Institutional controls will be maintained on the BNL property to prevent the installation and operation of drinking water and other pumping wells that may increase the potential for exposure to contaminated groundwater or interfere with the groundwater monitoring program. Public water was provided to the off-site area containing contaminated groundwater from BNL in 1997 as part of a larger hookup program conducted by the U.S. Department of Energy through the Suffolk County Water Authority. For new construction, Suffolk County Department of Health Services private water system standards (Article 4 of the Suffolk County Sanitary Code) require the connection to public water mains if they exist within 150 feet of any property line. The public water system standards will limit the installation of drinking water wells, but does not address wells installed for irrigation.
- A removal action completed at the Imhoff Tank (Sub-AOC 4C) in 1995 is selected as the final remedy. The sludge in the Imhoff Tank was removed, treated and disposed of off-site. The remaining concrete structure was demolished, backfilled with clean fill, and capped with concrete. No further action is required for this sub-AOC.
- Soil and groundwater associated with the Hold-up Ponds (Sub-AOC 4D) and Satellite Disposal Area (Sub-AOC 4E) do not pose an unacceptable risk to human health or the environment. No further action is required for the Satellite Disposal Area. Long-term groundwater monitoring will be

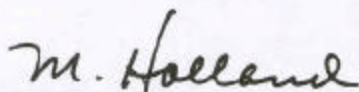
implemented as an institutional control to assure continued effectiveness of the Hold-up Ponds.

In addition to the above, any sale or transfer of BNL property will meet the requirements of 120(h) of CERCLA to ensure that future users are not exposed to unacceptable levels of contamination.

DECLARATION

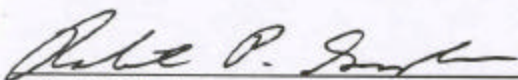
The selected remedies are protective of human health and the environment, comply with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial actions, and are cost effective. These remedies utilize permanent solutions and alternative treatment technologies to the maximum extent practical for this site. Treatment of contaminated soil was not found to be practical therefore, these remedies do not satisfy the statutory preference for treatment as a principal element. However, techniques that minimize waste volumes or further stabilize wastes to meet disposal facility waste acceptance criteria may be identified during the Remedial Action Work Planning process.

Because this remedy will result in hazardous substances remaining in groundwater and soil above health-based levels for unrestricted use, a review will be conducted every five years after the commencement of remedial action to ensure that the remedies continue to provide adequate protection of human health and the environment.



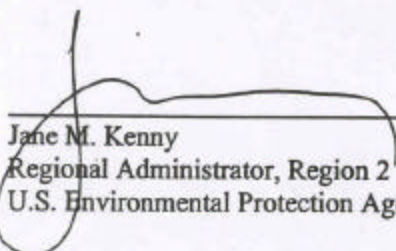
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LIST OF ACRONYMS

AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
BER	Brookhaven Executive Roundtable
BNL	Brookhaven National Laboratory
CERCLA	Comprehensive Environmental Response Compensation & Liability Act
COPC	Chemicals of Potential Concern
DOE	United States Department of Energy
EPA	United States Environmental Protection Agency
ERL	Effects Range Low
ERM	Effects Range Median
FS	Feasibility Study
IAG	Interagency Agreement
MCL	Maximum Contaminant Level
mg/kg	milligrams per kilogram
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NESHAPS	National Emissions Standards for Hazardous Air Pollutants
NPL	National Priority List
NYCRR	New York State Codes, Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OU	Operable Unit
PCB	Polychlorinated biphenols
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RESRAD	Residual Radioactive Material Guideline Computer Code
RI	Remedial Investigation
ROD	Record of Decision
SC	Suffolk County
SCDHS	Suffolk County Department of Health Services
S&EP	Safety and Environmental Protection Division
SPDES	State Pollutant Discharge Elimination System
STP	Sewage Treatment Plant
TAGM	NYSDEC Technical Assistance Guidance Memorandum
TBC	To Be Considered
TCE	trichloroethylene, trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
µg/l	micrograms per liter
VOC	Volatile Organic Compound
WCF	Waste Concentration Facility

II. DECISION SUMMARY

1. SITE NAME, LOCATION, AND DESCRIPTION

Brookhaven National Laboratory (BNL) is a federal facility owned by the U.S. Department of Energy (DOE). BNL conducts research in physical, biomedical and environmental sciences and energy technologies.

BNL is located about 60 miles east of New York City, in Upton, Suffolk County, New York, near the geographic center of Long Island (Figure 1). Distances to neighboring communities from BNL are as follows: Patchogue 10 miles west-southwest; Bellport 8 miles southwest; Center Moriches 7 miles southeast; Riverhead 13 miles east; Wading River 7 miles north-northeast; and Port Jefferson 11 miles northwest.

The BNL property, consisting of 5,321 acres, is an irregular polygon, and each side is approximately 2.5 miles long. Figure 2 is a current land-use map of the BNL site. The developed portion of the site includes the principal facilities, located near the center of the site on relatively high ground and contained in an area of approximately 900 acres, 500 acres of which were originally developed for Army use. For the most part, the remaining 400 acres are occupied by various large research machine facilities. The outlying facilities occupy approximately 550 acres and include an apartment area, Biology Field, Former Hazardous Waste Management Area, Sewage Treatment Plant, firebreaks, and the Former Landfill Area. The terrain is gently rolling, with elevations varying between 40 to 120 feet above sea level. The land lies on the western rim of the shallow Peconic River watershed, with a tributary of the river rising in marshy areas in the northern section of the tract.

The sole-source aquifer beneath BNL comprises three water-bearing units: the Moraine and outwash deposits, the Magothy Formation, and the Lloyd Sand Member of the Raritan Formation. These units are hydraulically connected and make up a single zone of saturation with varying physical properties extending from a depth of 5 to 1,500 feet below the land surface. These three water-bearing units are designated as a "sole source aquifer" by the U.S. Environmental Protection Agency (EPA) and serve as the primary source of drinking water for Nassau and Suffolk Counties.

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The BNL site, formerly Camp Upton, was occupied by the U.S. Army during World Wars I and II. Between the wars, the site was operated by the Civilian Conservation Corps. It was transferred to the Atomic Energy Commission in 1947, to the Energy Research and Development Administration in 1975, and to DOE in 1977.

In 1980, the BNL site was placed on New York State's Department of Environmental Conservation's (NYSDEC's) list of Inactive Hazardous Waste Sites. On December 21, 1989, the BNL site was included on EPA's National Priorities List because of soil and groundwater contamination that resulted from BNL's past operations. Subsequently, the EPA, NYSDEC, and DOE entered into a Federal Facilities Agreement (herein referred to as the Interagency Agreement, IAG) that became effective in May 1992 (Administrative Docket Number: II-

CERCLA-FFA-00201) to coordinate the cleanup. The IAG identified areas of concern that were grouped into operable units to be evaluated for response actions. The IAG requires a remedial investigation/feasibility study for Operable Unit V, pursuant to 42 U.S.C. 9601 et. Seq., to meet CERCLA requirements. The IAG also requires cleanup actions to address the identified concerns.

BNL's Response Strategy Document (SAIC, 1992) grouped the identified areas of concern into seven operable units; several were subsequently combined. Remedial investigations and risk assessments were conducted to evaluate the nature and extent of contamination, and the potential risks associated with the areas of concern addressed in this Record of Decision. A Feasibility Study (IT, 1998) was prepared to evaluate the alternatives for remediating the contaminated groundwater, sediment and soil.

Operable Unit V is located in the northeastern quadrant of the property along the eastern property border. Figure 3 shows its extent. OU V includes the following AOCs and Sub-AOCs:

- Sewage Treatment Plant (STP, AOC 4),
 - Sub-AOC 4A: Sludge Drying Beds
 - Sub-AOC 4B: Sand Filter Beds/Berms
 - Sub-AOC 4C: Imhoff Tank
 - Sub-AOC 4D: Hold-up Ponds
 - Sub-AOC 4E: Satellite Disposal Area
- Sewer Lines (AOC 21),
- Eastern Off-site Tritium Plume (AOC 23), and
- Peconic River (AOC 30).

Table 1 describes these AOCs. The STP is located adjacent to the Peconic River. Adjacent areas in Sub-AOC 4B include two areas immediately north and south of the sand filter beds and the BNL Firing Range berms (Figure 4). The sewer line runs from East Fifth Avenue to the STP [approximately 3,400 feet (1 kilometer)] and is currently retired and capped (Figure 5). The Eastern Off-site Tritium plume was so named because of an initial concern about tritium migrating off the BNL property in groundwater. However, further characterization indicated that tritium concentrations are well below the drinking-water standard of 20,000 pCi/L. Groundwater sampling during the remedial investigation also detected contamination of volatile organic compounds (VOCs), primarily trichloroethene (or trichloroethylene, TCE) both on and off the BNL property in the vicinity of the Sewage Treatment Plant.

The contamination in soil, sediment and groundwater documented before the Remedial Investigation is described in the Operable Unit V Work Plan (IT, 1994). More detailed descriptions and references are given in the Remedial Investigation Report for Operable Unit V (IT, 1998a).

3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

A Community Relations Plan was finalized for the BNL site in September 1991. In accordance with this plan and CERCLA Section 113 (k) (2)(B)(I-v) and 117, the community relations program focused on informing and involving the public. A variety of activities were

used to provide information and to seek public participation, including compilation of a stakeholders mailing list, community meetings, availability sessions, site tours, workshops and the development of fact sheets. An Administrative Record was established, documenting the basis for the selection of removal and remedial actions at the BNL site, and is maintained at the local libraries listed below, and at EPA's Region II Administrative Records Room at 290 Broadway, New York, NY, 10001-1866.

Longwood Public Library
800 Middle Country Road
Middle Island, NY 11953

Mastics-Moriches-Shirley Community Library
301 William Floyd Parkway
Shirley, NY 11967

Brookhaven National Laboratory
Research Library
Bldg. 477A
Upton, NY 11973

Consistent with CERCLA guidance and state requirements, community involvement and participation was solicited for all significant documents and decisions associated with this Record of Decision. The final scope of work, the work plan, quality assurance plan, risk assessment documents, remedial investigation reports, the proposed plan and the feasibility study were made available for public review.

The latest community involvement activities included the review of the Operable Unit V Feasibility Study (IT, 1998b), the Plutonium Contamination Characterization and Radiological Dose and Risk Assessment Report (IT, 2000) and the Proposed Plan (BNL, 2000). A public comment period for the review of the OU V Proposed Plan began on February 15, 2000. An eight-page summary of the proposed plan was mailed to about 2,500 homes on the Environmental Restoration Division mailing list. Two roundtable meetings to discuss the proposed remedy were held on February 23rd and 29th at BNL and Riverhead High School, respectively. Over 30 members of the community attended these two meetings. A public meeting, attended by approximately 40 people, was held on March 2, 2000 in Berkner Hall Auditorium at Brookhaven National Laboratory. Copies of the Proposed Plan, the eight-page summary, and other related information material were available. Based upon the concern of the community that adequate time be provided to conduct a comprehensive review and comment on this remedial action decision, a 60-day extension to the public comment period was granted. The public comment period ended on May 15, 2000. The Responsiveness Summary section of this document summarizes the written and oral comments and DOE's responses on the preferred alternatives.

Level of Community Support for the Proposed Alternative

During the ninety-day public comment period, hundreds of written comments were received on the OU V documents. The majority of the comments received was opposed to the plan of excavating areas of the Peconic River with sediment above cleanup goals and focused on

minimizing wetland damage from the proposed excavation and sediment dispersion during remediation of the river sediment. Few comments were focused on the sewage treatment plant and groundwater.

In response to these comments, DOE deferred the decision on how to address the Peconic River. A final remedy for the Peconic River cleanup will be documented in a separate Record of Decision.

The proposed remedy for the sewage treatment plant and groundwater, which is documented in the Record of Decision, was largely supported. There were no significant comments in opposition to these remedies.

Changes in the Remedy Presented in the FS and PRAP

The following modifications were made to the preferred remedial alternative based on the concerns and input of the EPA and the New York State Department of Environmental Conservation after the public comment period in the spring of 2000.

- The cleanup goal for cesium-137 was changed from 67 pCi/g to an average concentration of 23 pCi/g with hot spots no greater than three times the cleanup goal to allow greater flexibility in future land use. This change in cleanup goal did not alter the cost of remedy.
- Excavation and off-site disposal of soil above the cleanup goals will be performed at the Sludge Drying Beds. This additional work will involve a minimal cost increase.
- Sludge from ten manholes associated with the Sewer Lines (AOC 21) will be removed.

4. SCOPE AND ROLE OF OPERABLE UNIT AND RESPONSE ACTION

Response actions for Operable Unit V will be addressed in two separate Records of Decision. This Record of Decision selects remedial actions for some AOCs and sub-AOCs in OU V, including a localized removal of soil contaminants at the Sewage Treatment Plant (Sub-AOC 4B) and Sludge Drying Beds (Sub-AOC 4A), continued monitoring of contaminants in groundwater (AOC 23), and removal of sludge from 10 manholes along the retired sewer line that lead to the STP (AOC 21). The remedy also includes a completed removal action at the Imhoff Tanks (Sub-AOC 4C). Soil and groundwater associated with the Hold-up Ponds (Sub-AOC 4D) do not pose an unacceptable risk. However, additional groundwater monitoring will be conducted. Post-remediation monitoring will verify soil cleanup levels across all sub-AOCs.

Based on public and local official comments, as well as the EPA's and NYSDEC's recommendations, DOE decided to defer its decision on the cleanup remedy for the Peconic River sediment. A final remedy for the Peconic River (AOC 30) cleanup project will not be completed until further environmental evaluation and community involvement is completed and will be documented in a separate Record of Decision. A new proposed plan will be prepared and a public comment period will be conducted as part of this process.

5. SUMMARY OF SITE CHARACTERISTICS

The main purposes of the Remedial Investigation (IT, 1998a) were to determine the nature, magnitude, and extent of soil, sediment, groundwater and surface water contamination from the AOCs included in Operable Unit V, and to characterize the potential health risks and environmental impacts of any contaminants present. The investigation included: geophysical and biological surveys, sampling of soil, groundwater, surface water, sediment and sewer pipes; chemical and radiological analyses; benthic invertebrate toxicity testing; fish bioaccumulation studies; and data validation. The contaminants analyzed for in the Remedial Investigation were metals, pesticides, PCBs, volatile organic compounds, semi-volatile organic compounds, and many radionuclides. An additional study (IT, 2000) further characterized the extent of radiological contamination, particularly for plutonium, in the Peconic River's sediment, surface water, and fish; for soil in the sand filter beds/berms and adjacent areas at the STP; for the retired and capped sewer line; and for groundwater in the vicinity of the STP.

5.1 Identification of Contamination

Classification of the nature and extent of soil and groundwater contamination was based on screening criteria for chemicals and radiological constituents in various media. The specific screening criteria used for the BNL OU V study area are detailed in section 4.2 of the Remedial Investigation Report (IT, 1998a). Whenever possible, established regulatory criteria known as "chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs)" were used to screen the analytical data. ARARs were used as screening criteria for groundwater, where state and/or federal drinking-water standards exist for many chemicals. In the absence of ARARs, non-enforceable regulatory guidance values, known as "to be considered" criteria, or "TBCs" were used to screen the data. This was the case for soil, which have no established state or federal ARARs. Radionuclides in soil, for which there are no individual ARAR or TBC concentrations, were screened against site-specific levels calculated using a risk model (RESRAD; ANL, 1993) that allowed a dose limit of 15 millirem/year above background. Screening criteria for sediment were selected as the higher of site background levels or the most stringent sediment screening criteria available (NYSDEC sediment screening criteria, Long and McDonald (1995) screening criteria).

A more recent investigation that characterized plutonium and other radionuclides in soil, sediment, surface water, fish and groundwater included, for comparison, samples of surface water and sediment from a reference location (Connetquot River) and groundwater from wells located 18-30 miles west of BNL.

5.2 Summary of Nature and Extent of Contamination

Table 3 summarizes the primary contaminants and maximum concentration found in each Area of Concern addressed by this Record of Decision.

Soil at the STP Sand Filter Beds/Berms (Sub-AOC 4B)

Past operations and practices led to waste water containing radionuclides and chemicals being discharged at the Sewage Treatment Plant. The contaminants were subsequently

sequestered in the sand filter beds. Periodic scraping of the filter beds up onto the berms resulted in the distribution of contamination on the bermed areas surrounding the beds.

The contaminants found most frequently and at the highest concentrations relative to screening levels were mercury and cesium-137. Levels of both were highest in the sand filter berms and areas adjacent to the sand filter beds. The maximum concentration of mercury was 19.1 mg/kg reported from the supplemental sampling of the RI (BNL, 2001). Cesium-137 was present at a maximum concentration of 98.8 pCi/g (IT, 1998a). Mercury and cesium-137 are the only constituents present that require remedial action.

The RI also found other inorganic constituents (silver, chromium, and lead) and radionuclides (americium-241 and plutonium-239/240) above screening levels in surface and subsurface soil at the sand filter beds and sand filter berms although not at concentrations requiring cleanup.

Supplemental sampling in the vicinity of the Sewage Treatment Plant in September 2000 identified an area at BNL's Firing Range (located in the eastern portion of the property directly north of the STP sand filter beds – Figure 4) with elevated levels of mercury and cesium-137 (BNL, 2001). The maximum concentrations were 13.9 mg/kg for mercury and 35.1 pCi/g for cesium-137. Based on this information, the BNL Firing Range will be included in the overall remedy for the sewage treatment plant.

Sludge and Soil at the Retired and Capped Sewer Line (AOC 21)

The Laboratory sampled the soil surrounding the areas where leaks were identified along the sewer line during the Operable Unit V investigation. The results of the investigation identified only 8 inorganic analytes at concentrations that exceeded the screening concentrations. With the exception of nickel and thallium (maximum concentrations of 215 mg/kg and 1.8 mg/kg, respectively), the elevated concentrations of inorganics were detected at a low frequency (i.e., less than twice) or at concentrations that only slightly exceeded screening levels.

As part of a more recent investigation, sludge was collected from the bottom of manholes along the retired and capped sewer line and analyzed for radionuclides. The results identified elevated activities of a few radionuclides. Americium-241 (maximum 22 pCi/g) and cesium-137 (12.85 pCi/g) were found at the highest activities relative to screening levels. Plutonium was also detected, generally at low levels (plutonium-238 maximum 0.63 pCi/g; plutonium-239/240 maximum 3.42 pCi/g). The current status of the sewer line (retired and capped at both ends) is such that no exposure pathway presently exists which could pose a risk to workers or the public.

Groundwater (AOC 23)

Past operations and practices led to waste water containing radionuclides and chemicals being discharged at the Sewage treatment Plant. While most of the contaminants were sequestered in the sand filter beds, some of the most mobile contaminants (tritium and trichloroethene) migrated to the groundwater.

Current groundwater sampling results indicate that levels of tritium in the groundwater are well below the drinking water standard. The highest concentration of trichloroethene (TCE)

found on the BNL property during the Remedial Investigation was 32 ug/l. The maximum level found during the Remedial Investigation off of the BNL property was 8.5 ug/l, slightly greater than the drinking water standard of 5 ug/l. The highest concentration of TCE reported previously off of the BNL property was 12 ug/l. Samples collected in 2000 (BNL, 2001) found a maximum TCE concentration on the property of 17.9 ug/l and a maximum concentration off the property of 10.7 ug/l (Figure 6).

The elevated levels of TCE in groundwater off the BNL property were found at depths of approximately 200 feet below land surface. Homes and businesses in the OU V area were offered public water in 1997 (Figure 7).

Other Sub-Areas of Concern

Both soil and groundwater samples were collected in the area of the Sludge Drying Beds (Sub-AOC 4A), Imhoff Tanks (Sub-AOC 4C), Hold-up Ponds (Sub-AOC 4D) and Satellite Disposal Area (Sub-AOC 4E). With the exception of the Sludge Drying Beds, no contaminants were detected at levels requiring remediation. One elevated sample of mercury (8.4 mg/kg) was reported at the surface of the Sludge Drying Beds that will require cleanup. The Hold-up Ponds will be monitored. No further action is planned for the remaining areas.

6. SUMMARY OF SITE RISKS

As part of the Operable Unit V Remedial Investigation/Risk Assessment, a baseline risk assessment was done to estimate the human-health and ecological risks that could result from exposure to contaminants in Operable Unit V if there were no remediation beyond that accomplished to date. The human-health risk assessment evaluated both present and future potential exposures to contaminants. The findings of the risk assessment are documented in the Operable Unit V Remedial Investigation/Risk Assessment Report (IT, 1998a). An additional radiological-risk assessment was done that combined the data collected in the Remedial Investigation with those collected in another study that further characterized the extent of radiological contamination in Operable Unit V (IT, 2000). The following sections address the risk assessment relative to the Sewage Treatment Plant.

6.1 Human Health Risks

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current and future land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the contaminants of concern at the site in various media (i.e., soil, groundwater, surface water, air, etc.) are identified based on such factors as toxicity, frequency of occurrence, fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil.

Factors relating to the exposure assessment include but are not limited to the concentrations that people might be exposed to and the potential frequency and duration of exposure. Using these factors, a reasonable maximum exposure scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response) are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other non-cancer health effects such as changes in the normal functions of organs within the body (e.g., changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and non-cancer health effects.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a one-in-ten-thousand excess cancer risk; or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions explained in the Exposure Assessment. Current federal Superfund guidelines for acceptable exposures are an individual lifetime excess cancer risk in the range of 10^{-4} to 10^{-6} (corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk). For non-cancer health effects, a hazard index (HI) is calculated. An HI represents the sum of the individual exposure levels compared to their corresponding reference doses. The key concept for a non-cancer HI is that a threshold level (measured as an HI of less than or equal to 1) exists below which non-cancer health effects are not expected to occur. A Hazard Index greater than 1.0 indicates a potential for non-carcinogenic effects.

Human-health risks were evaluated for potential exposures to radiological and chemical contaminants of concern. The chemical risk assessment addressed the risk of cancer and non-carcinogenic toxicity associated with exposure to chemical contaminants. The radiological risk assessment evaluated the potential carcinogenic risks associated with exposure to radionuclides.

6.1.1 Identification of Contaminants of Potential Concern

Chemicals of potential concern were selected based on procedures specified in EPA's Risk Assessment Guidance for Superfund, Part A (EPA, 1989). Contaminants evaluated in the risk assessment exceeded screening levels based on their degree of toxicity, concentration, frequency of detection, chemical properties important to potential release, transport, and exposure, and significant exposure routes. Table 3 identified contaminants of potential concern.

6.1.2 Exposure Assessment

As part of the risk assessment, present and potential future-use scenarios were quantitatively evaluated.

For Current Land Use, two on-site exposure scenarios were investigated: an on-site worker who could be exposed to surface soil through inhalation, ingestion, and direct contact;

and an older child trespasser who might come into contact with contaminated soil, sediment and surface water in the Peconic River headwaters.

For Future Land Use, two scenarios were investigated: an on-site construction worker, and future hypothetical residents living in the area of the current Sewage Treatment Plant. The construction worker was assumed to be exposed to contaminants through inhalation of soil particulates and dusts; incidental ingestion of soil; and direct dermal contact with soil. The hypothetical future resident was assumed to be exposed to contaminants in soil, sediment, surface water and groundwater after a loss of institutional control in the future. Exposure to contaminants in home-grown food and deer meat was considered as a pathway in the radiological risk analysis.

6.1.3 Toxicity Assessment

The toxicity assessment consisted of examining the toxicological properties of selected chemicals of potential concern using the most current data on human-health effects. Many of the carcinogenic slope-factors and reference doses used were obtained from EPA's Integrated Risk Information System database. Those that were not available in that database were obtained from EPA's Health Effects Assessment Summary Tables. The potential health hazards associated with exposure to non-carcinogens were determined by comparing the estimated chronic or subchronic daily intake of a chemical with the reference dose. A toxicity profile for each chemical of potential concern was developed using EPA toxicity assessments and accompanying values. When toxicity values were not available for a specific chemical, the chemical was qualitatively evaluated. Uncertainties in the chemical toxicity data were also considered. Some toxicity values in the risk assessment are extremely conservative estimates, and include uncertainty factors that may reduce the estimated safe exposure concentrations by up to 1,000 times.

6.1.4 Characterization of Chemical Risks

For Current Land Use, all risks for chemical contaminant exposures to the on-site worker and the trespasser, assuming no cleanup, were within EPA's acceptable risk range for carcinogenic risks and below the acceptable Hazard Index of 1 for non-carcinogenic hazards.

Under the Future Land Use Scenario, all risks for chemical exposures to future workers were within EPA's acceptable risk range for carcinogenic risks and below the acceptable Hazard Index of 1 for non-carcinogenic hazards. For hypothetical future on-site residents living near the Sewage Treatment Plant, the non-carcinogenic Hazard Index is greater than 1.0 (1.8 and 4.9 for adult and young child, respectively). Manganese (not VOCs or radionuclides) in the unfiltered groundwater would contribute the majority of this potential health hazard. The carcinogenic risks for these hypothetical future on-site residents (5×10^{-5} and 3×10^{-5} for an adult and young child, respectively) were within EPA's acceptable risk range. The majority of any potential cancer risk would be from arsenic in unfiltered groundwater.

6.1.5 Characterization of Radiological Risks

Radiological risks to the current on-site industrial worker using upper bound exposure estimates exceeded EPA's acceptable risk range with a maximum risk of 3.0×10^{-4} , but were within control levels established for workers trained in radiation protection. The risk was due

almost entirely to the external gamma radiation pathway with the major contributor being cesium-137 contamination in the soil at the sewage treatment plant.

Under the Future Land Use Scenario, radiological risks to the hypothetical future on-site resident living at the sewage treatment plant, assuming no remediation and using upper bound exposure estimates, exceeded EPA's acceptable risk range with a maximum risk of 3.4×10^{-4} (using a 95% upper confidence level, or UCL). As with the current land use scenario, the risk was due almost entirely to the external gamma radiation pathway with the major contributor being cesium-137 contamination in the soil at the sewage treatment plant.

6.2 Ecological Risk

The Ecological Risk Assessment was performed to determine whether historical activities at Operable Unit V resulted in levels of chemical and radiological contamination that could adversely affect the ecosystems there.

A standard ecological risk assessment (as prescribed by the EPA) uses a four-step process to assess ecological risks for a reasonable maximum-exposure scenario:

Problem Formulation – a qualitative evaluation of a contaminant's release, migration and fate; identification of contaminants of concern, receptors, exposure pathways and known ecological effects of the contaminants; and selection of endpoints for further study.

Exposure Assessment – a quantitative evaluation of the release, migration and fate of the contaminant; characterization of exposure pathways and receptors; and measurement or estimation of exposure point concentrations.

Ecological Effects Assessment – literature reviews, field studies and toxicity tests linking contaminant concentrations to effects on ecological receptors.

Risk Characterization – measurement or estimation of current and future adverse effects.

Unlike assessments of human health risk, which are concerned with effects on individuals, assessments of ecological risk focus on wildlife populations and ecosystem-level effects. It is difficult to draw inferences at the population and ecosystems level, and the ecological assessment for Operable Unit V was largely a qualitative one.

Risk to terrestrial wildlife was assessed through modeling exposure of wildlife to contaminated soil at the Sand Filter Beds and Berms. The opportunity for exposure is limited, based on the habitat potential of the Sand Filter Beds, so this actually represents a hypothetical future scenario. The greatest potential risk was found to be due to mercury and silver, which could be translocated to plants from the soil, and accumulate in small mammals or invertebrates which could then be consumed by predators such as fox and hawk. However, the habitat at the Sand Filter Beds significantly reduces the exposure to mercury and silver by wildlife.

7. BASIS FOR RESPONSE/REMEDIAL ACTION OBJECTIVES

This section identifies the basis for taking remedial actions, the objectives of the remedial actions, land-use considerations and cleanup goals.

7.1 Basis for Response

The actual or threatened releases of hazardous substances from OU V may present an imminent and substantial endangerment to public health, welfare or the environment if they are not addressed by implementing the remedial actions selected in this Record of Decision. The major concern in this operable unit is radiological due to cesium-137 in the soil of the sewage treatment plant berms. Radiological risks to the hypothetical future on-site resident living at the STP using upper confidence level (95% UCL) exposure estimates exceeded EPA's acceptable risk range. Mercury was also selected as a contaminant of concern because of the frequency of occurrence at concentrations exceeding the soil screening criteria.

7.2 Remedial Action Objectives

Remedial action objectives (RAOs) are specific goals to protect human health and the environment. They are based on available information and standards, such as the applicable or relevant and appropriate requirements (ARARs) and risk-based levels established in the risk assessment. After evaluating the nature and extent of contamination in the soil and groundwater, and assessing the chemical and radiological risks associated with exposure to contaminants of potential concern, the following RAOs were developed for groundwater and soil at the sewage treatment plant:

Groundwater

- Protect public health and the sole source aquifer.
- Continue to collect the data needed to characterize and monitor levels of groundwater contamination.

Sewage Treatment Plant Soil

- Reduce the levels of contamination in the sand filter beds/berms and adjacent areas.
- Prevent or minimize the migration of contaminants present in the surface soil via surface runoff and windblown dusts.
- Prevent or minimize human and environmental exposure to contaminants in the surface and subsurface soil. This includes site workers, construction workers, trespassers, and future residents.
- Prevent or minimize the potential for uptake of contaminants present in the soil by ecological receptors.
- Prevent or minimize the potential for migration of contaminants (chemical and radiological) from the soil to groundwater.

7.3 Land Use

BNL is currently used by the DOE as a research facility with associated support facilities and is expected to remain so for the foreseeable future. Access to the BNL site is currently

restricted and controlled. It is assumed that this institutional control will continue for at least the next 50 years.

A future land use study was undertaken and published by BNL in 1995 (BNL 1995). Potential land uses that could occur after BNL closes as a national laboratory were identified as a mix of open space, industrial/commercial, recreational and residential uses. DOE's future land use for the Sewage Treatment Plant is expected to remain industrial/commercial for the near future (i.e., at least 50 years).

7.4 Cleanup Goals

Soil in the Sand Filter Beds and Berms at the Sewage Treatment Plant contains elevated concentrations of mercury, silver, chromium, lead, and radionuclides (primarily cesium-137). The remedial investigation identified mercury and cesium-137 as the most frequently occurring contaminants that exceeded the soil screening criteria. In addition, cesium-137 was determined by the radiological risk assessment to be the major contributor to risks posed to human health by the radionuclides and mercury was shown to bioaccumulate in fish in the Peconic River. Therefore, the cleanup levels for remediation of the sand filter beds and berms are based on mercury and cesium-137. Also, the remedial investigation determined that the elevated concentrations of silver, chromium, lead and other radionuclides are co-located within the soils containing elevated concentrations of mercury and cesium-137. Soil remediation will be conducted using best management practices such that all contaminants are reduced and that no residuals will contribute a risk to human health.

The mercury cleanup goal for the localized removal of soil in the sand filter beds and adjacent berms was chosen based on the EPA action level for the protection of groundwater for mercury (2 mg/kg) (EPA, 1996).

The cleanup goal for cesium-137 at the sewage treatment plant was calculated using the DOE Residual Radioactive Material Guidelines (RESRAD) computer code and is based on the following:

- A total dose limit of 15 mrem/yr above background;
- Assuming a future residential land use; and
- 50 years of institutional control of the area.

Based on this information, the cleanup goal within the affected areas of the sewage treatment plant will be such that the remaining average concentration for cesium-137 will be less than 23 pCi/g. A hot spot criterion of three times the cleanup goal of 23 pCi/g will also be applied. Contaminant concentrations above this criterion would be removed even if the average concentration were less than the 23 pCi/g. This cleanup goal allows for current industrial use without controls and future residential land use after the assumed 50-year period of institutional control. These goals replace the proposed goal of 67 pCi/g contained in the Proposed Plan and Feasibility Study in response to concerns expressed by the EPA and NYSDEC after the public comment period.

In the unlikely event the property is transferred, specific requirements outlined in section 120 (h) of CERCLA will be met. These requirements ensure that future users of the property are not exposed to unacceptable levels of contamination.

An As-Low-As-Reasonably-Achievable (ALARA) analysis will be performed during the remedial planning to identify cost-effective measures for further reducing exposure to residual contamination below the above-mentioned cleanup goals. Post remediation sampling and dose assessments will be performed to ensure that the limit of 15 mrem/year above background will be met for all radionuclides that remain. The NYSDEC guidance of 10 mrem/yr above background has also been adopted as an ALARA goal that will be considered during the planning and construction phase.

8. DESCRIPTION OF ALTERNATIVES

Section 121 of CERCLA requires that each selected site remedy protects human health and the environment, is cost-effective, complies with other statutory laws, and uses permanent solutions, alternative treatment technologies and resource-recovery alternatives as fully as practicable. In addition, the statute includes a preference for treatment as a principal element for reducing the toxicity, mobility, or volume of the hazardous substances.

Four potential scenarios for the remediation of contaminated soils at the STP were evaluated in Appendix F of the OU V Feasibility Study Report (IT 1998b). These scenarios are summarized below. They varied in the proposed cleanup goal for mercury, which ranged from 0.1 ppm to 9.8 ppm; and for cesium-137, which included 23 pCi/g as the average concentration goal and 67 pCi/g as the hot spot criterion of three times the cleanup goal level. A hot spot criterion level for cesium-137 of 67 pCi/g was used for three scenarios; a cleanup goal for cesium-137 of 23 pCi/g was used for Scenario 2. The cost estimates for each scenario listed below are still reasonable for this revised cleanup goal.

Each scenario described below requires continued groundwater monitoring to confirm reduction of VOC concentrations to MCLs. Groundwater monitoring data will be reviewed at least annually. Any proposed changes to the remedy will be based on the monitoring data.

Scenario 1: Removal of Soils with Mercury > 0.1 ppm and Cesium-137 > 67 pCi/g

	<u>Cost Estimate</u>
Soil Remediation	\$16,285,000
Annual Groundwater Monitoring	\$45,000
Total Groundwater Monitoring (present worth)	\$1,350,000
Total Present Worth	\$17,635,000

Under this scenario, soils at the sand filter beds/berms and adjacent areas containing levels of mercury exceeding 0.1 ppm or cesium-137 exceeding 67 pCi/g would be excavated. Soil removal would take place at all eight sand filter beds, as well as the sand berms. Excavated portions of the sand filter beds would be replaced with clean sand or gravel, and excavated areas on the berms backfilled with clean fill, compacted and graded. Excavated materials would be disposed of in a licensed off-site disposal facility. This scenario would involve removal of the greatest amount of material among the four scenarios evaluated.

Scenario 2: Removal of Soils with Mercury > 2 ppm and Cesium-137 > 67 pCi/g

	<u>Cost Estimate</u>
Soil Remediation	\$1,459,000
Annual Groundwater Monitoring	\$45,000
Total Groundwater Monitoring (present worth)	\$1,350,000
Total Present Worth	\$2,809,000

Under this scenario, soils at the Sand Filter Beds and Berms and adjacent areas containing levels of mercury exceeding 2 ppm (EPA level for protection of groundwater) or cesium-137 exceeding 67 pCi/g would be excavated. Soil removal would take place only in sand filter bed #7, as well as the sand berms. Excavated portions of the sand filter bed would be replaced with clean sand or gravel, and excavated areas on the berms backfilled with clean fill, compacted and graded. Excavated materials would be disposed of in a licensed off-site disposal facility.

Modified Scenario 2: Removal of Soils with Mercury > 2 ppm and Cesium-137 > 23 pCi/g

Modified Scenario 2 was included in response to regulator comments during the review of the draft Record of Decision to incorporate an average cleanup goal of 23 pCi/g for cesium-137 as described in Section 7.4. The estimated costs and description of remediation activities are similar to Scenario 2 with the exception that soil with cesium-137 at levels exceeding 23 pCi/g would be excavated.

Scenario 3: Removal of Soils with Mercury > 4.9 ppm and Cesium-137 > 67 pCi/g

	<u>Cost Estimate</u>
Soil Remediation	\$855,000
Annual Groundwater Monitoring	\$45,000
Total Groundwater Monitoring (present worth)	\$1,350,000
Total Present Worth	\$2,205,000

Under this scenario, soils at the sand filter beds/berms and adjacent areas containing levels of mercury exceeding 4.9 ppm (one-half the sediment toxicity based level) or cesium-137 exceeding 67 pCi/g would be excavated. As in scenario 2, soil removal would take place only in sand filter bed #7, as well as the sand berms. Excavated portions of the sand filter bed would be replaced with clean sand or gravel, and excavated areas on the berms backfilled with clean fill, compacted and graded. Excavated materials would be disposed in a licensed off-site disposal facility.

Scenario 4: Removal of Soils with Mercury > 9.8 ppm and Cesium-137 > 67 pCi/g

	<u>Cost Estimate</u>
Soil Remediation	\$259,000
Annual Groundwater Monitoring	\$45,000
Total Groundwater Monitoring (present worth)	\$1,350,000
Total Present Worth	\$1,609,000

Under this scenario, soils at the sand filter beds/berms and adjacent areas containing levels of mercury exceeding 9.8 ppm (the sediment toxicity based level) or cesium-137 exceeding 67 pCi/g would be excavated. No sample locations in the sand filter beds exceeded these cleanup levels, therefore excavation would take place only in the sand berms. Excavated areas on the berms would be backfilled with clean fill, compacted and graded. Excavated materials would be disposed of in a licensed off-site disposal facility. This scenario would involve removal of the least amount of material among the four scenarios evaluated.

9. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

A comparative analysis of the scenarios was conducted to evaluate the relative performance of each scenario mentioned above with respect to the following three criteria: effectiveness, implementability and cost. The purpose of this analysis was to determine the advantages and disadvantages of each scenario, which provides the rationale for selecting a preferred alternative. Cost estimates for each scenario varied depending on the waste disposal scenario assumed.

9.1 Effectiveness

Of the four alternatives, Scenario 1 is the most effective in reducing contaminant levels because the greatest amount of soil volume would be removed in order to achieve the cleanup levels. The reduction of contamination within the sand beds is identical for Scenarios 2 and 3; however, Scenario 2 results in a greater reduction of contamination in the sand berms than Scenario 3. Scenario 4 is the least effective because it will result in the lowest volume of soil removed, and therefore the lowest level of contaminant reduction.

9.2 Implementability

All four of the scenarios discussed at the sewage treatment plant are technically feasible and implementable. They all involve excavation and disposal methods that are well developed, proven, and conventionally used. The short-term risks posed to workers and the community during the removal would be highest for Scenario 1 because of the extensive amount of material handling involved. Risks decrease as the amounts to be removed decrease. Using standard health and safety practices and engineering controls to reduce airborne particle generation and exposure pathways will minimize short-term risks to workers and the community.

9.3 Cost

Scenario 1 is the most costly due to the large amounts of soil that would have to be removed. Scenario 2 is somewhat more expensive than Scenario 3 due to the larger soil volumes removed from the berms. Scenario 4 is the lowest in cost.

9.4 Modifying Criteria

The modifying criteria are used in the final evaluation of remedial alternatives. The two modifying criteria are State and community acceptance. For both criteria, the factors that are considered include the elements of the alternatives that are supported, those that are not

supported and those that are strongly opposed.

State Acceptance

State acceptance addresses whether the State agrees with, opposes, or has no comment on the preferred alternative. The State of New York concurs with the selected remedial actions for the Sludge Drying Beds (AOC 4A), Sewage Treatment Plant soil (AOC 4B), OU V groundwater (AOC 23) and Sewer Lines (AOC 21). The State of New York also concurs with the decision to take no further action at several other sub-areas of concern associated with Operable Unit V (Sub-AOC 4C, 4D, and 4E).

Community Acceptance

Community acceptance addresses the issues and concerns the public may have regarding each of the alternatives. A variety of activities were used to provide information to the public and to seek their participation, including compilation of a stakeholders mailing list, community meetings, availability sessions, site tours, workshops, and the development of fact sheets.

The written and verbal comments received from the public and local government officials during the public comment period and at the public meeting on March 2, 2000 have been evaluated. The results of the evaluation indicate that local government officials and the community support the preferred remedial alternative for the Sewage Treatment Plant soil (AOC 4B), OU V groundwater (AOC 23) and Sewer Lines (AOC 21) as well as the decision to take no further action at several other sub areas of concern associated with Operable Unit V (Sub-AOC 4A, 4C, 4D, and 4E). No major objections to the preferred remedies discussed in this Record of Decision were raised at the public meeting or during the public comment period.

10. SELECTED REMEDIES

This section documents the selected remedial actions for Operable Unit V. Table 2 summarizes the selected remedies for the AOCs and Table 4 summarizes the associated costs. The remedy has been selected based on consideration of CERCLA requirements, public comments and feedback from the regulatory agencies.

Institutional controls at BNL, which ensure that workers and the public are not exposed to unacceptable levels of contamination, include existing DOE orders and site-specific procedures. DOE Orders such as 5400.1 (General Environmental Protection Program) and 5400.5 (Radiation Protection of the Public and Environment) govern the management of radioactive waste and other waste types not regulated under RCRA or CERCLA at DOE facilities. Site-specific procedures such as BNL ESH 1.3.6 (Work Planning and Control for Operations) ensure that all work at BNL is planned and implemented properly, hazards and risks are identified and controlled, resources are scheduled and coordinated, and appropriate feedback mechanisms are in place. In addition, BNL ESH 1.1.18 (Excavation Safety) ensures that, prior to conducting excavation work, the Project Manager will check site maps and investigate, as appropriate, the potential for soil/pavement/floor contamination (radioactive or chemical). A background check that includes the history of activities in the vicinity is also required as part of this procedure.

In addition, any sale or transfer of BNL properties will also meet the requirements of 120(h) of CERCLA to ensure future users are not exposed to unacceptable levels of contamination.

The major components of the selected remedies include:

STP Sand Filter Beds and Berms (Sub-AOC 4B) and Sludge Drying Beds (Sub-AOC 4A)

A localized removal of soil contamination (Modified Scenario 2) will be performed to remove mercury and cesium-137 above the cleanup goals identified in Section 7.4. The cleanup goal within the affected areas of the Sewage Treatment Plant will be such that the remaining average concentration for cesium-137 will be less than 23 pCi/g. A hot spot criterion of three times the cleanup goal of 23 pCi/g will be applied. The cleanup goal for mercury is 2 ppm, based on the EPA action level for protection of groundwater.

This removal of contamination will reduce the potential for leaching and subsequent migration to groundwater and the Peconic River, and will reduce potential risks associated with cesium-137 in soil. Soil from the Sand Filter Beds, Sludge Drying Beds, and adjacent areas exceeding cleanup goals will be removed through excavation. Excavated portions of the sand beds will be replaced with sand or gravel. Excavated areas on the sand filter berms will be backfilled with clean fill, compacted and graded. Excavated materials will be disposed of in a licensed disposal facility. Post-remediation sampling and dose assessments, including a DOE independent survey, will be performed to ensure that the cleanup goals are met.

An As-Low-As-Reasonably-Achievable (ALARA) analysis will be included in the Remedial Action Work Plan to identify cost effective measures for further reducing exposure to residual contamination below cleanup goals. Techniques that minimize waste volumes or further stabilize wastes to meet disposal facility waste acceptance criteria may also be identified in the Remedial Action Work Plan.

Long-term institutional controls and monitoring will occur to ensure that planned uses remain protective of public health. In addition, any sale or transfer of BNL property will meet the requirements of 120(h) of CERCLA to ensure that future users are not exposed to unacceptable levels of contamination.

Groundwater (AOC 23)

Groundwater contaminated with low levels of volatile organic compounds (VOCs) associated with this AOC will be monitored. This remedy is subject to a five-year review until MCLs are reached. Groundwater monitoring data will be reviewed at least annually. Any proposed changes to the remedy will be based on the monitoring data. Institutional controls will be maintained on the BNL site to prevent the installation and operation of drinking water and other pumping wells that may increase the potential for exposure to contaminated groundwater or interfere with the groundwater monitoring program.

Public water was provided to the off-site area containing contaminated groundwater from BNL in 1997 as part of a larger hookup program conducted by the U.S. Department of Energy through the Suffolk County Water Authority and will reduce the potential for exposure to contaminated groundwater. In addition, Suffolk County Department of Health Services private

water system standards (Article 4 of the Suffolk County Sanitary Code) require the connection to public water for new construction where public water mains exist off the BNL property and will limit the installation of additional drinking water wells.

Imhoff Tanks (Sub-AOC 4C)

The Remedial Investigation detected elevated levels of metals and low levels of radioactivity within the sludge collected at the bottom of the Imhoff Tanks. No leakage of contaminants from the Imhoff Tank to surrounding soil and groundwater was detected. The sludge in the Imhoff Tank was removed, treated and disposed of off site by transporting it to Envirocare in Utah. In March, 1997, the remaining Imhoff tank concrete structure was tested and determined to be clean; demolished; and backfilled with clean fill and covered with concrete. No further action is required for this sub-AOC.

Hold-up Ponds (Sub-AOC 4D)

Both soil and groundwater samples were collected in the area of the Hold-up Ponds during the investigations, and no evidence of leakage was found. No further action is required under the BNL CERCLA program. These ponds will remain as part of BNL's operating Sewage Treatment Plant and a groundwater monitoring network has been put in place as an institutional control to assure continued effectiveness of the Hold-up Ponds.

Satellite Disposal Area (Sub-AOC 4E)

In 1985, bromine trifluoride cylinders and two boxes of laboratory chemicals were removed from this area. The soil and groundwater in the Satellite Disposal Area were thoroughly characterized and exploratory excavations were conducted. No evidence of contamination was found which required further action. No further action is required for this area.

Sewer Lines (AOC 21)

The Laboratory sampled the soil surrounding the areas where leaks were identified along the sewer line during the initial Remedial Investigation. The results of the investigation identified only a few areas with low concentrations of inorganic constituents. As part of a more recent investigation, sludge was collected from the bottom of manholes along the retired and capped sewer line and analyzed for radionuclides. The results of this investigation identified elevated activities of a few radionuclides. The current status of the sewer line (retired and ends capped) is that no exposure pathway presently exists which could pose a risk to workers and the public.

Removal of sludge from 10 manholes along the retired sewer line that lead to the STP will be performed. Long-term institutional controls and monitoring will be conducted to ensure and protect public health and the environment. Institutional controls for the retired and capped sewer lines will be implemented to ensure that they remain intact and are not excavated.

11. STATUTORY DETERMINATIONS

Remedy selection is based on CERCLA and its amendments, and the regulations contained in the National Contingency Plan. All remedies must meet the threshold criteria:

protection of human health and the environment, and compliance with ARARs. CERCLA also requires that the remedy use permanent solutions and alternative treatment technologies to the maximum extent practicable, and that the implemented action must be cost-effective. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

11.1 Protection of Human Health and the Environment

The selected remedy for the contaminated soil at the Sewage Treatment Plant protects human health and the environment by removing and disposing of contaminated soil. Removing the contaminated soil minimizes both risks of exposure to on-site workers and risks associated with future-use scenarios, as well as minimizing the potential for migration of contaminants into the underlying groundwater and ultimately the Peconic River.

Implementing the remedy will cause no unacceptable short-term risks or cross-media impacts.

11.2 Compliance with ARARs

The National Contingency Plan Section 300.430 (P) (5) (ii) (B) requires that the selected remedy attains the federal and state ARARs or obtains a waiver of an ARAR.

11.2.1 Chemical-Specific ARARs

The chemical-specific ARARs that the selected remedies will meet are listed below.

1. Safe Drinking Water Act, Public Law 95-523, as amended by Public Law 96502, 22 USC 300 et. seq. National Primary Drinking Water Regulations (40 Code of Federal Regulations 141) and National Secondary Drinking Water Regulations (40 Code of Federal Regulations 143). This establishes MCLs and secondary MCLs for public drinking water supplies that are relevant and appropriate at the BNL facility.
2. New York Water Quality Standards, 6 NYCRR Part 703. This requirement establishes standards of quality and purity for groundwaters of the State.
3. RCRA (40 code of Federal Regulations parts 260-268): Defines hazardous wastes. All wastes classified as hazardous will be handled, stored, and disposed of in accordance with these regulations. Hazardous wastes will be disposed of at a permitted facility.
4. New York State Hazardous Waste Regulations (6 NYCRR Part 370 - 373): Defines hazardous wastes in New York State. All wastes classified as hazardous will be handled, stored, and disposed of in accordance with these regulations. Hazardous wastes will be disposed of off site at a permitted facility.

11.2.2 Location-Specific ARARs

No location-specific ARARs were identified.

11.2.3 Action-Specific ARARs

The action-specific ARARs that the selected remedies will meet are listed below.

1. 10 Code of Federal Regulations Part 835. This regulation establishes the requirements for controlling and managing radiologically contaminated areas. Compliance with this regulation is required as of January 1996.
2. RCRA (40 Code of Federal Regulations parts 260-268): As described above.
3. New York State Hazardous Waste Regulations (6 NYCRR Part 370-373): As described above.
4. NESHAPS (40 CFR 61, Subpart H.) This requirement sets forth the permitting process for remedial action.
5. 6 NYCRR Part 211. This regulation requires control of fugitive emissions from excavation and transport.

11.2.4 To Be Considered Guidance

In implementing the selected remedy, the following guidance will be considered.

1. U.S. EPA, May 1996, "Soil Screening Guidance: Technical Background Document," EPA/540/R-95/128, Appendix A, Generic Soil Screening Levels for Superfund. Soil remediation goal for mercury was developed using this guidance.
2. DOE Order 5400.5 and draft 10 Code of Federal Regulations 834 "Radiation Protection of the Public and the Environment": This order, and its current draft rule-making, were used to develop radiological soil-remediation levels for Operable Unit I and will apply to the soil remediation at the Sewage Treatment Plant. The basic public dose limit for exposure to residual radioactive material for DOE facilities such as BNL is 100 mrem/year above background plus application of the As Low As Reasonably Achievable (ALARA) policy. Based on BNL site-specific conditions and ALARA, 15 mrem/year above background was selected. This level is consistent with risk requirements under CERCLA.
3. NYSDEC Technical and Administrative Guidance Memorandum "Remediation Guideline for Soils Contaminated with Radioactive Materials" (#4003), September 1993. This memorandum contains State guidance for remediating radiologically contaminated soils. The State's value of 10 mrem/yr above background serves as an additional goal for remediation to be evaluated during remedial design and implementation.

11.3 Cost-Effectiveness

Based on the expected performance standards, the selected remedies were determined to be cost effective because they provide overall protection of human health and the environment, long- and short-term effectiveness, and compliance with ARARs, at an acceptable cost. Table 4 provides a cost summary of the selected remedies.

11.4 Use of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The National Contingency Plan prefers a permanent solution whenever possible. The selected remedy is a final action that uses permanent solutions to the maximum extent practicable. The Sewage Treatment Plant remedial action involves the removal and disposal of contaminated soil that poses a potential risk to exposed populations, and, therefore, is a permanent remedy for the existing contaminants of interest. The waste generated from this remedial action will be disposed of in a licensed facility off the BNL property.

11.5 Preference for Treatment as a Principal Element

This alternative does not meet the USEPA's statutory preference for treatment as a principal component. There will be no treatment to reduce the toxicity, mobility, or volume of the contaminants in soil. Because of the small volumes of soil involved and the contaminants of concern, treatment is not cost-effective.

11.6 Documentation of Significant Changes

Comments received during the public comment period for the proposed plan were reviewed. No significant changes to the selected remedy for the AOCs covered by this Record of Decision, as identified in the Proposed Plan, were necessary. Minor changes were made in response to concerns expressed by the EPA and NYSDEC after the public comment period and are described in Section 3.

11.7 Five-Year Review

Five-year reviews will be necessary to evaluate the effectiveness of the institutional control to restrict inappropriate land use at the Sewage Treatment Plant. Five-year reviews will also be necessary for OU V groundwater until MCLs are reached.

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TABLES

**Table 1 (cont.)
Operable Unit V Areas of Concern**

Area of Concern	Description
<p align="center">AOC 21 Sewer Lines</p>	<p>BNL's first sanitary sewer lines were installed in 1917. They were repaired and upgraded in the 1940s. These sewer lines carried various laboratory and sanitary wastes from research and support facilities to the STP. Approximately 3,400 feet of underground lines are contained within Operable Unit V. The sewer lines' integrity was studied between the various BNL facilities and the STP. This study indicated that there was about a 13 to 15 percent line loss between major facilities and the STP; most of this loss occurred in the 30-inch vitreous clay pipes used between the merger of all the sewer lines and the STP. The Sewer Line in Operable Unit V was replaced in January 1993, and all wastewater flow has been diverted to the newly installed sewer lines.</p>
<p align="center">AOC 23 Eastern Off-site Tritium Plume</p>	<p>The Eastern Offsite Tritium Plume was so named because of an initial concern about tritium migrating off the BNL property in groundwater. Groundwater investigations conducted in 1984 and 1985 in response to elevated levels of tritium in the STP effluent in 1984 revealed a groundwater plume at the eastern border of the BNL site. This is known as the Eastern Tritium Plume. Effluent from the STP can reach groundwater from losses from the Sand Filter Beds or by recharging along the Peconic River. The source of the tritium was distillate from the evaporation process at the Waste Concentration Facility that was discharged to the STP. At the most impacted monitoring well off the BNL property, the tritium concentration had reached 25,000 picocuries per liter (pCi/l); the drinking water standard is 20,000 pCi/l. In response, Suffolk County Department of Health Services (SCDHS) began sampling private supply wells in an area downgradient of the contamination released from the STP and east and southeast of BNL to determine if the tritium had reached private supply wells. Tritium was detected in some samples, but none of its concentrations in the wells approached the drinking water standard. The highest level found off Laboratory property in 2000 is 492 picocuries per liter, less than three percent of the drinking water standard. The most recent maximum detection for Operable Unit V groundwater on the BNL property is 1,480 picocuries per liter.</p> <p>Groundwater sampling during the remedial investigation also detected elevated levels of trichloroethene (TCE) in OU V groundwater. The highest concentration of TCE found on the BNL property during the remedial investigation was 32 ppb. Maximum levels off the property were 8.5 ppb, slightly greater than the drinking water standard of 5 ppb. Samples collected in 2000 found a maximum TCE concentration on the property of 17.9 ppb and a maximum concentration off the property of 10.7 ppb.</p>

Table 2
Summary of Selected Remedies and Completed Removal Actions in Operable Unit V

AOC No.	Name	Selected Remedial Actions
30	Peconic River	No action selected in this ROD. Following additional evaluations and public comment, a remedy will be selected in a separate ROD.
4A	Sludge Drying Beds	Modified Scenario 2 – localized action to remove elevated levels of mercury from the Sludge Drying Beds. In addition, any sale or transfer of BNL property will meet the requirements of 120(h) of CERCLA to ensure that future users are not exposed to unacceptable levels of contamination.
4B	Sand Filter Beds/Berms	Modified Scenario 2 – localized action to remove elevated levels of mercury and cesium-137 from the STP sand filter beds/berms and adjacent areas (This includes areas immediately north and south of the sand filter beds and the BNL Firing Range berms). Long-term institutional controls and monitoring will occur to ensure that planned uses remain protective of public health. In addition, any sale or transfer of BNL property will meet the requirements of 120(h) of CERCLA to ensure that future users are not exposed to unacceptable levels of contamination.
4C	Imhoff Tank	Completed Removal Action in 1997. Contents removed, disposed, structures demolished, filled, and capped. No further action.
4D	Hold-up Ponds	Hold-up ponds have not leaked. Groundwater monitoring network has been put in place as part of the Groundwater Improvement Program (Phase II) as an institutional control to assure continued effectiveness of the Hold-up Ponds.
4E	Satellite Disposal Area	Bromine trifluoride cylinders and (2) boxes containing laboratory chemicals were removed. No further action. No contaminants were detected at levels requiring remediation.
21	Sewer Lines	The Sewer Line within Operable Unit V was capped and replaced with a new line in January 1993, constructed adjacent to the old line. Removal of sludge from 10 manholes along the retired sewer line that lead to the STP will be performed. Institutional controls will prevent excavation or damage to the buried sewer line.
23	Eastern Component of Off-site Tritium Plume (VOC Contaminated Groundwater)	Tritium levels are well below the Maximum Contaminant Level (MCL). Levels of VOCs off the BNL property are slightly greater than the MCL of 5 ppb. Homes were offered public water in 1997. Monitoring will continue. Institutional controls will prevent exposure to on-site and off-site groundwater.

Table 3
Operable Unit V Areas of Concern and Extent of Contamination

AOC No.	Name	Media	Primary Contaminants	Maximum Concentration¹	Reference
4A	Sludge Drying Beds	Soil	Mercury	8.4 mg/kg	RI (IT, 1998a)
4B	Sand Filter Beds/Berms	Soil	Mercury Silver Copper Chromium Lead Zinc Thallium Cesium-137 Americium-241 Plutonium-239/240	15.1 mg/kg 112 mg/kg 80.7 mg/kg 157 mg/kg 95.5 mg/kg 60.7 mg/kg 1.2 mg/kg 98.8 pCi/g 5.41 pCi/g 7.31 pCi/g	RI (IT, 1998a) RI (IT, 1998a) RI (IT, 1998a) RI (IT, 1998a) RI (IT, 1998a) RI (IT, 1998a) RI (IT, 1998a) RI (IT, 1998a) RI (IT, 1998a) Pu Report (IT, 2000)
4C	Imhoff Tank	Soil Groundwater	None None		RI (IT, 1998a) RI (IT, 1998a)
4D	Hold-up Ponds	Soil Groundwater	None None		RI (IT, 1998a) RI (IT, 1998a)
4E	Satellite Disposal Area	Soil	None		RI (IT, 1998a)
21	Sewer Lines	Soil Sludge	None Americium-241 Cesium-137 Plutonium-239/240	22 pCi/g 12.85 pCi/g 3.42 pCi/g	RI (IT, 1998a) Pu Report (IT, 2000) Pu Report (IT, 2000) Pu Report (IT, 2000)
23	Eastern Off-site Tritium Plume	Groundwater	TCE (On-site) TCE (Off-site) Tritium (On-site) Tritium(Off-site) Manganese	32 ppb 8.2 ppb 2,280 pCi/l 1,130 pCi/l 6,320 µg/l	RI (IT, 1998a) RI (IT, 1998a) RI (IT, 1998a) RI (IT, 1998a) RI (IT, 1998a)

¹ Maximum concentration for each Area of Concern found during the Operable Unit V Remedial Investigation.

Table 4
Cost Summary for Selected Remedies ⁽¹⁾

AREA OF CONCERN	DESCRIPTION OF REMEDY	REMEDATION COST
STP Sand Filter Beds/Berms (Sub-AOC 4B) Sludge Drying Beds (Sub-AOC 4B)	<ul style="list-style-type: none"> • Excavation of contaminated soil above cleanup goals • Disposal at a licensed facility • Restoration of excavated areas 	\$1,459,000
Eastern Off-site Tritium Plume (AOC 23)	<ul style="list-style-type: none"> • Public water hookups offered • Continued monitoring for VOCs and tritium 	\$1,350,000 ⁽²⁾
Sewer Lines (AOC 21)	<ul style="list-style-type: none"> • Removal of sludge from 10 manholes along the retired sewer line that lead to the STP 	\$40,650

⁽¹⁾ Costs represent the estimated total present worth of the remediation

⁽²⁾ Groundwater monitoring cost represents a present worth based on annual cost of \$45,000 for 30 years. These costs are to confirm reduction in VOC concentrations and to provide confirmation that the VOC plume reaches MCLs within the area provided with public drinking water.

FIGURES

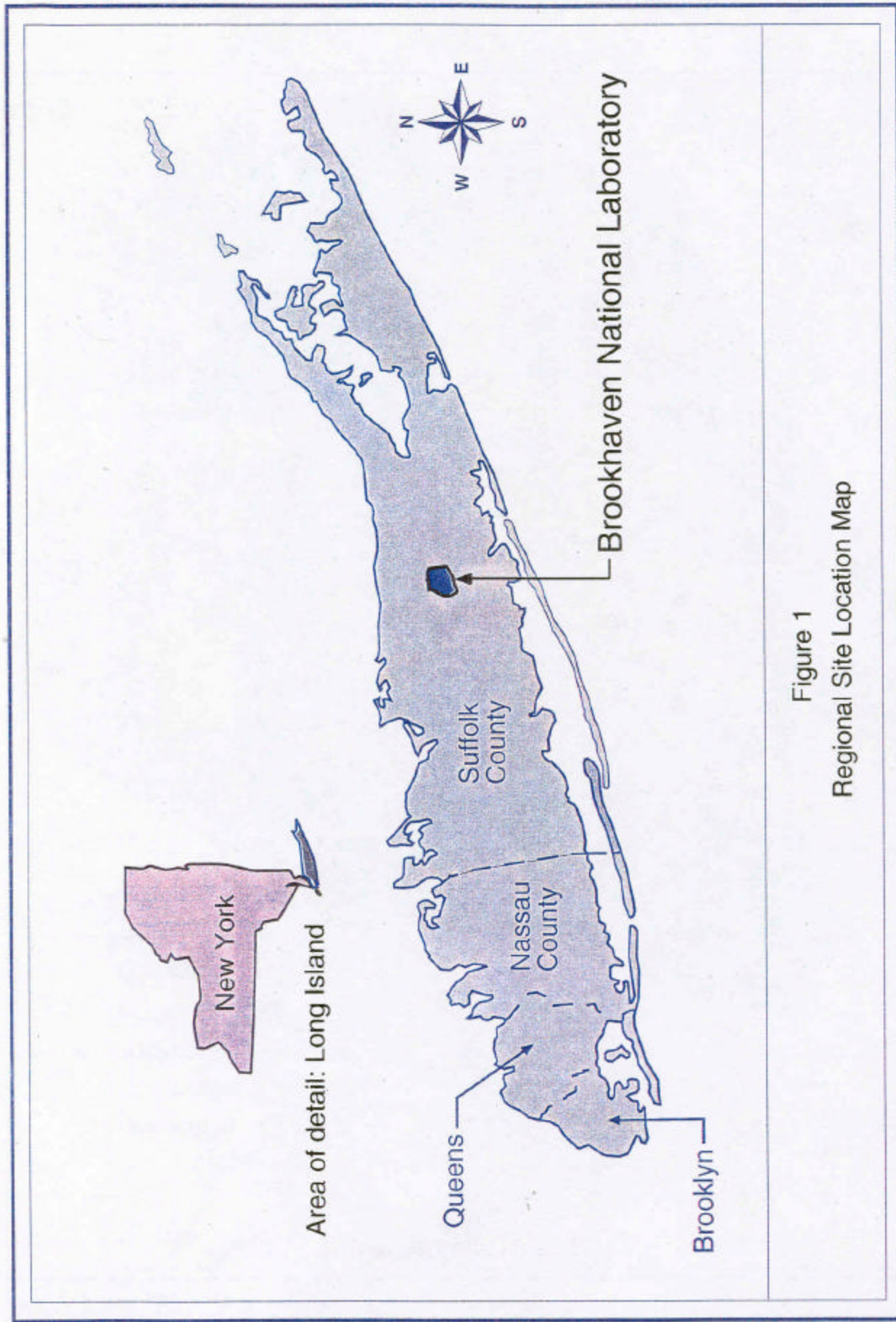
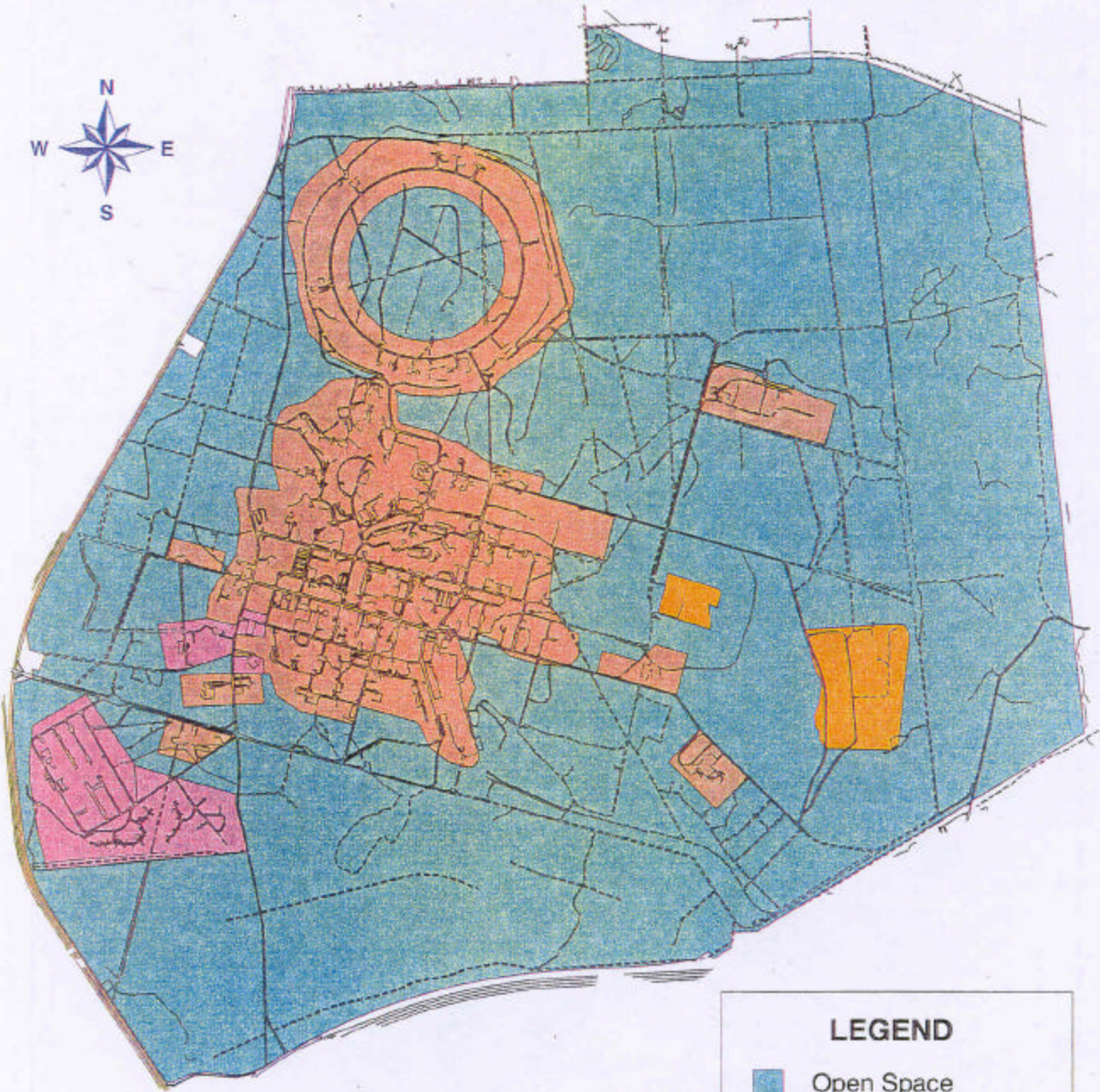
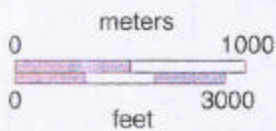


Figure 1
Regional Site Location Map



SCALE



LEGEND



-  Open Space
-  Industrial/Commercial
-  Agricultural
-  Residential

Figure 2
Current Land Use at BNL

Operable Units and Areas of Concern

- | | | |
|--------|---|--|
| I/VI | ■ | Waste Management Areas, Landfills, and Upland Recharge |
| II/VII | ■ | Alternating Gradient Synchrotron, Scrapyard, and Aerial Survey |
| III | □ | Potable and Supply Wells and Spills |
| IV | ■ | Central Steam Facility |
| V | ■ | Sewage Treatment Plant |

Operable Unit V Areas of Concern

- Sewage Treatment Plant
- (A - Sludge Drying Beds;
- B - Sand Filter Beds;
- C - Imhoff Tanks;
- D - Hold-Up Ponds;
- E - Satellite Disposal Area)
- Sewer Lines (not shown)
- Eastern Tritium Plume

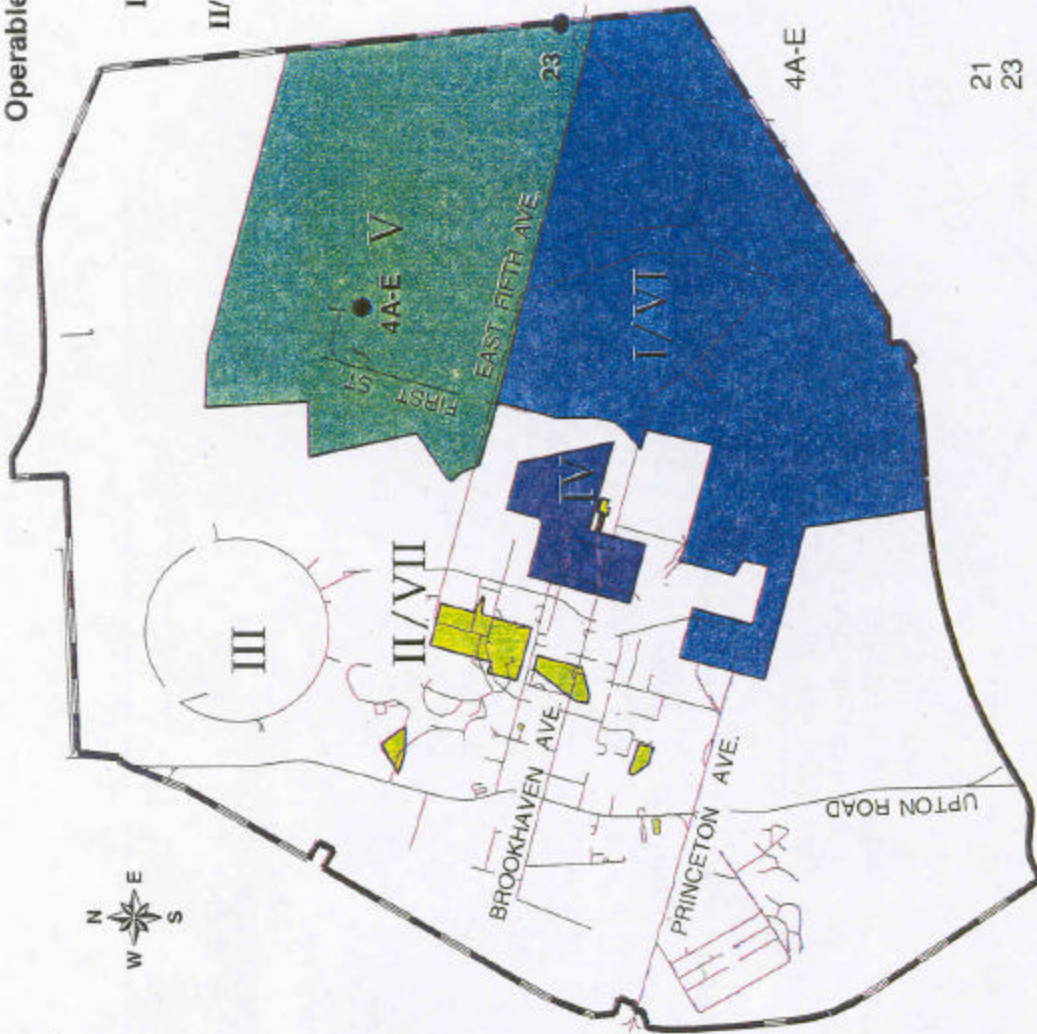


Figure 3
BNL Operable Units

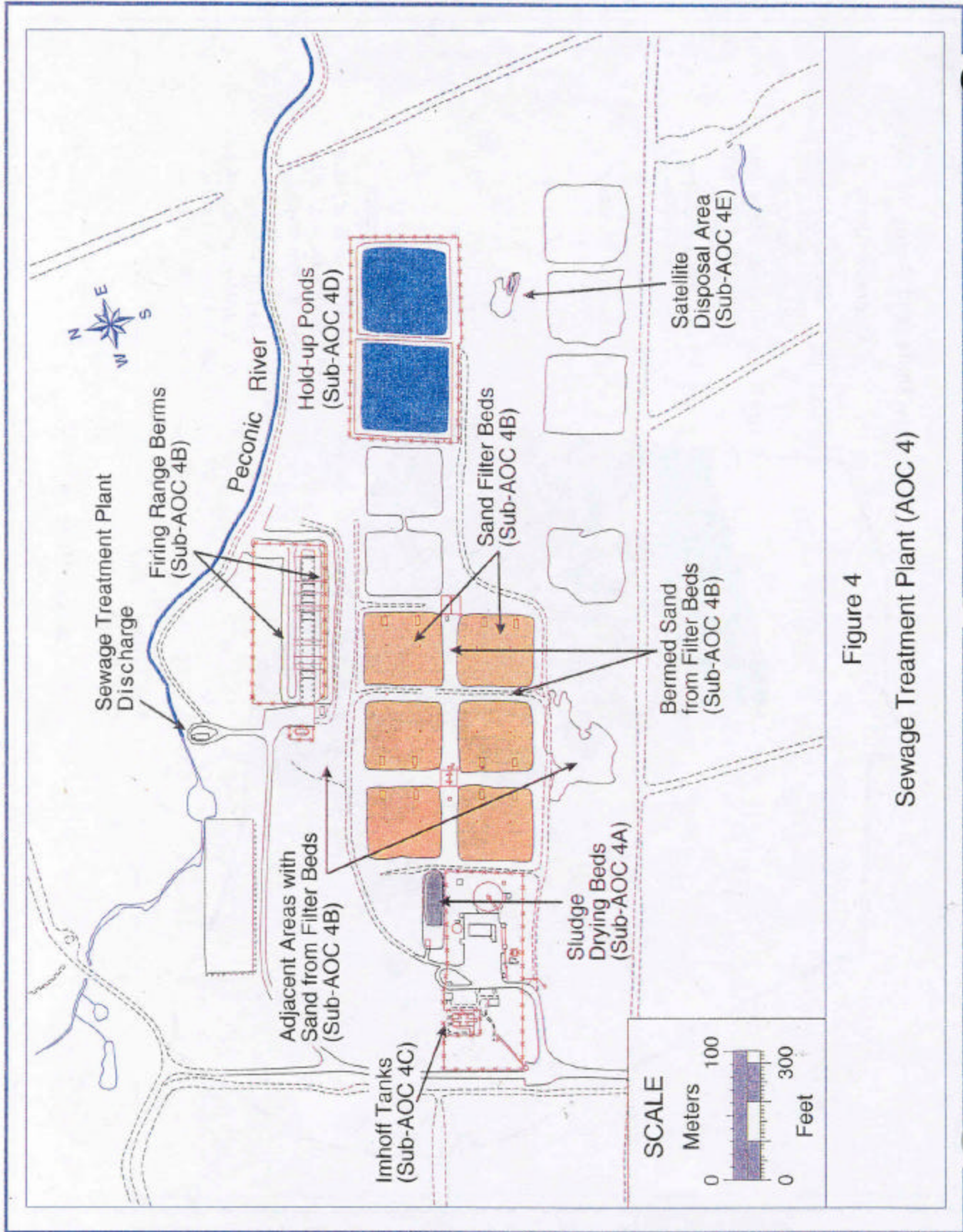
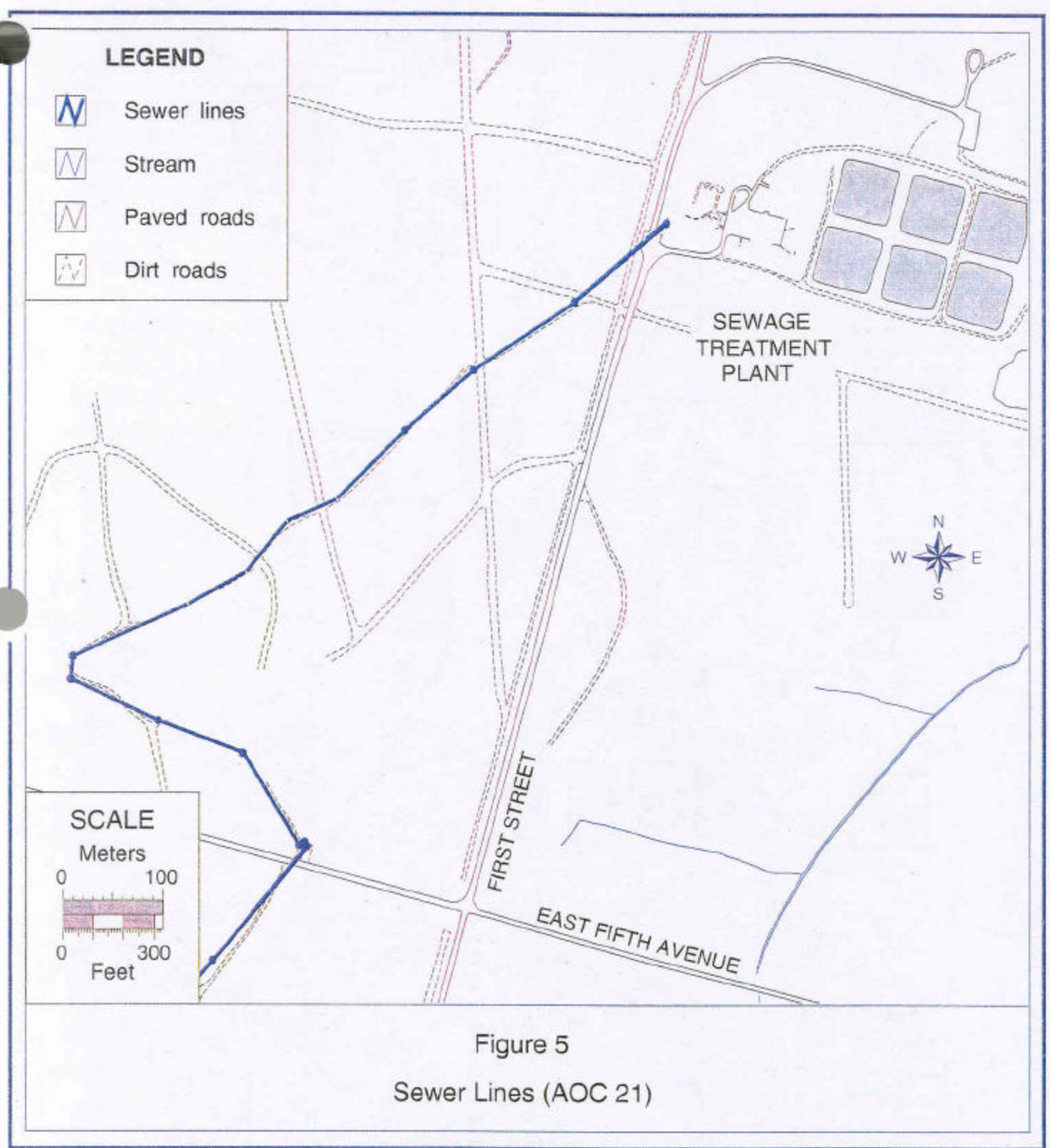


Figure 4

Sewage Treatment Plant (AOC 4)



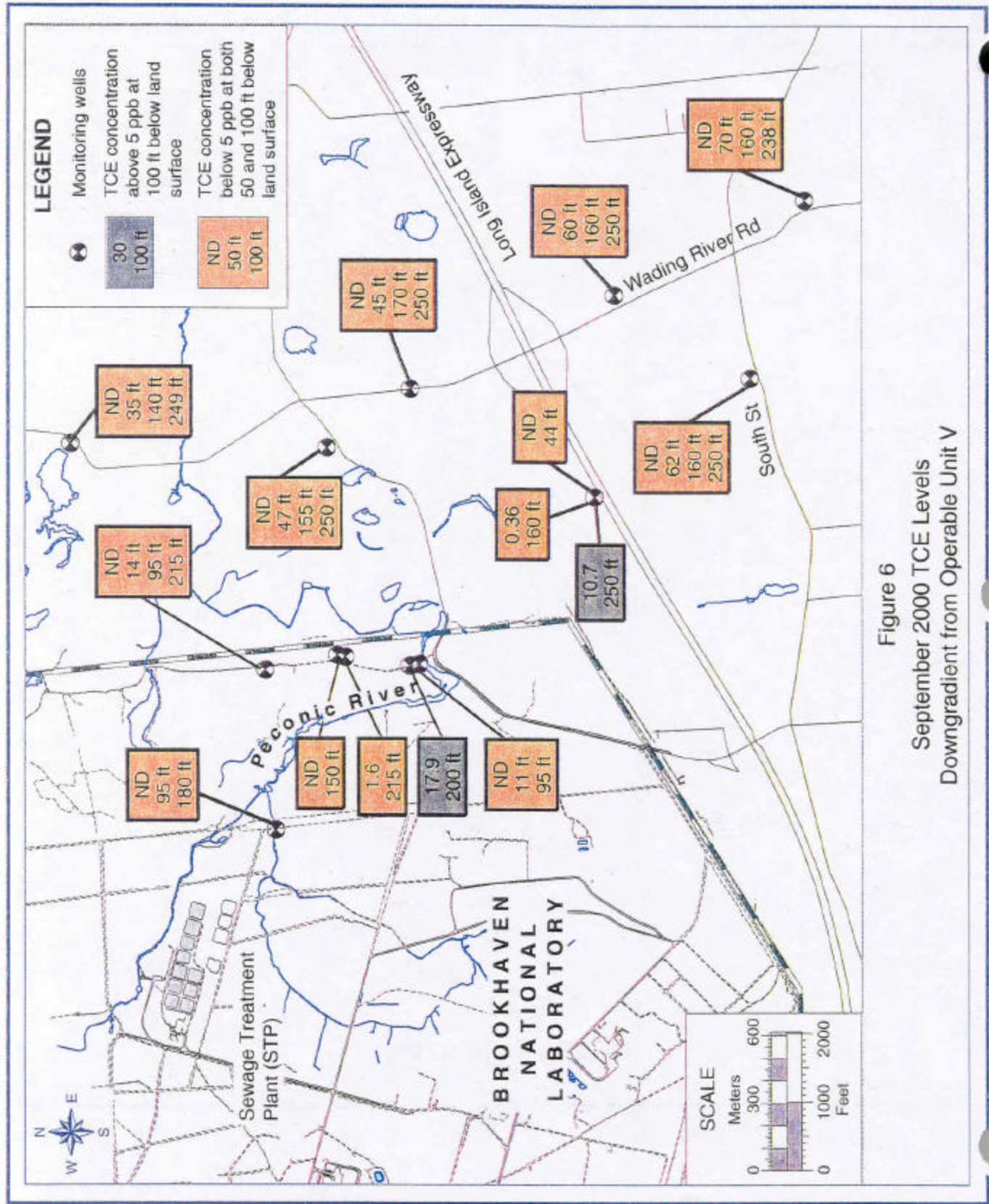


Figure 6
 September 2000 TCE Levels
 Downgradient from Operable Unit V

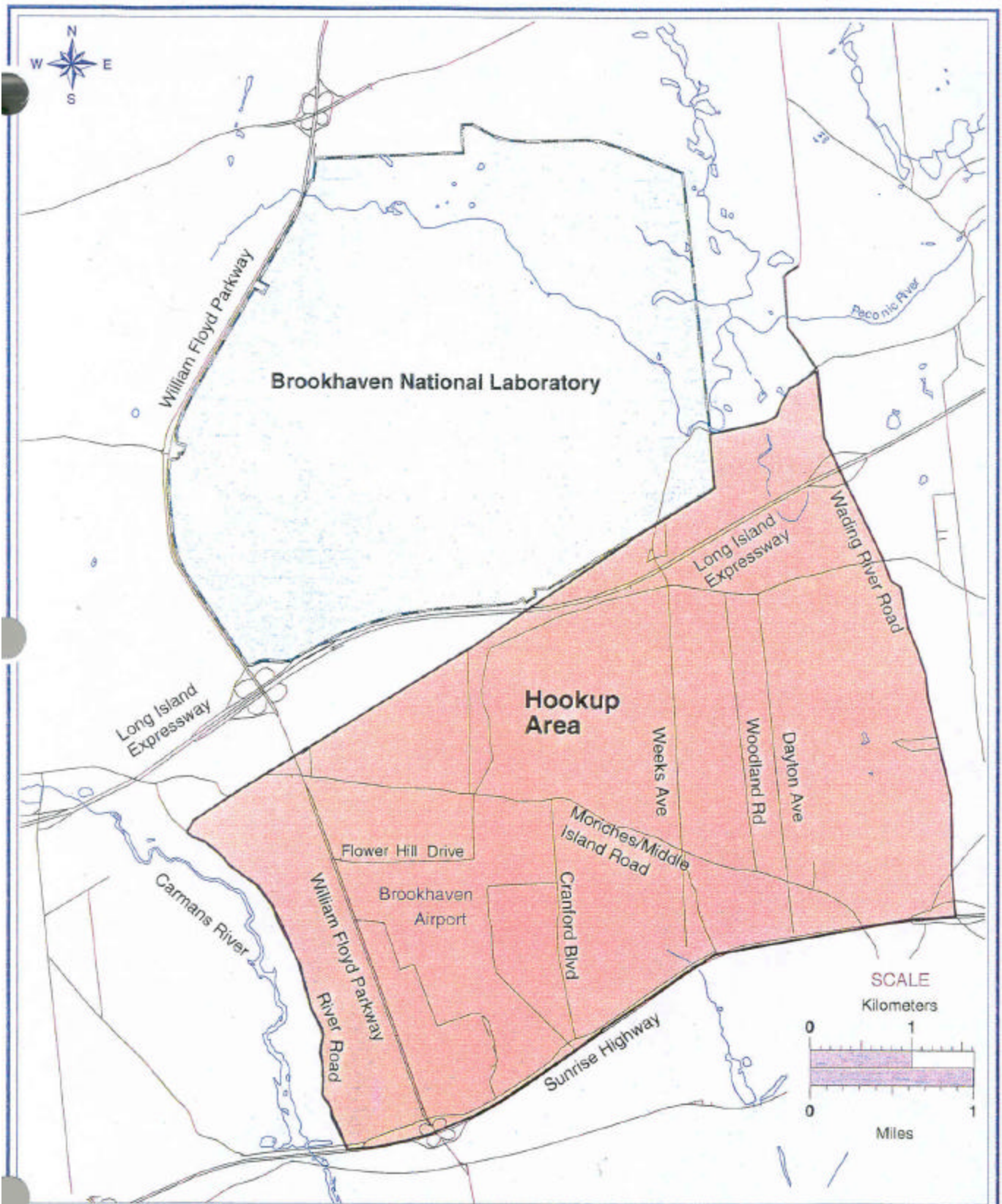


Figure 7
 Areal Extent of Public Water Hookup
 in Proximity to Brookhaven National Laboratory

U. S. DEPARTMENT OF ENERGY
BROOKHAVEN NATIONAL LABORATORY

OPERABLE UNIT V
RECORD OF DECISION

For

AOC 4 (Sewage Treatment Plant)

Sub-AOC 4A (Sludge Drying Beds)
Sub-AOC 4B (Sand Filter Beds/Berms)
Sub-AOC 4C (Imhoff Tanks)
Sub-AOC 4D (Hold-up Ponds)
Sub-AOC 4E (Satellite Disposal Area)

AOC 21 (Sewer Lines)

AOC 23 (Off-site Tritium Plume/Groundwater Monitoring)

III. RESPONSIVENESS SUMMARY

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1. INTRODUCTION

The public comments and concerns received on portions of the Proposed Plan for Operable Unit V (OU V) pertaining to the Sewage Treatment Plant, sewer lines, and groundwater at the Brookhaven National Laboratory (BNL) facility in Upton, New York are addressed in this Responsiveness Summary. The remedial action for the Peconic River portion of OU V and the associated public comments and concerns will be addressed in a separate Record of Decision and Responsiveness Summary, respectively.

This Responsiveness Summary serves the following two functions:

- It provides decision-makers with information about the views of the community regarding the proposed remedial action and feasible alternatives; and,
- It documents how public comments have been considered during the decision-making and provides answers to major comments.

A public comment period for the review of the OU V Proposed Plan began on February 15, 2000. Two roundtable meetings to discuss the proposed remedy were held on February 23rd and 29th at BNL and Riverhead High School, respectively. Over 30 members of the community attended these two meetings. A public meeting, attended by approximately 40 people, was held on March 2, 2000 in Berkner Hall Auditorium at Brookhaven National Laboratory. The U.S. Department of Energy (DOE) granted a 60-day extension to the public comment period, which then ended on May 15, 2000. Copies of the Proposed Plan and other related information material were provided at the following Administrative Record/Information Repositories for public review:

- U.S. EPA Region II, Administrative Records Room, New York, NY
- Longwood Public Library, Middle Island, NY
- BNL Research Library, Upton, NY
- Mastics-Moriches-Shirley Library, Shirley, NY

DOE has decided, based on public and local official comments and concurrence from the EPA and NYSDEC, to defer its decision on the cleanup remedy for the Peconic River until further evaluation and review of remedial action alternatives has been completed. A new proposed plan for the Peconic River remedy will be prepared and a public comment period will be conducted. Community involvement and input will be a critical element in selecting the final remedy for the Peconic River.

The community and local government officials are supportive of the proposed remedial alternative for the Sewage Treatment Plant soil, OU V sewer lines and groundwater. No major objections to the Sewage Treatment Plant, sewer lines or groundwater remedies were raised at the public meeting or during the public comment period.

The Responsiveness Summary is divided into the following sections:

1. INTRODUCTION
2. OVERVIEW OF THE RESPONSIVENESS SUMMARY
This section briefly describes the site background and DOE's proposed alternatives.
3. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS
This section provides the history of community concerns and describes community involvement in selecting a remedy for OU V.
4. COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS AND CONCERNS, AND DOE RESPONSES
This section summarizes the written comments DOE received during the public comment period, the oral and written comments received during the public meeting, and DOE's responses. General questions and issues and specific written technical questions are treated separately.
5. CHRONOLOGY OF COMMUNITY RELATIONS ACTIVITIES
This section gives a chronology of the significant Community Relations activities that pertain to OU V.
6. REFERENCES

2. OVERVIEW OF THE RESPONSIVENESS SUMMARY

2.1 Site History

The BNL site, formerly Camp Upton, was occupied by the U.S. Army during World Wars I and II. Between the wars, the site was operated by the Civilian Conservation Corps. It was transferred to the Atomic Energy Commission in 1947, to the Energy Research and Development Administration in 1975, and to DOE in 1977.

In 1980, the BNL site was placed on NYSDEC's list of Inactive Hazardous Waste Sites. On December 21, 1989, the BNL site was included on EPA's National Priorities List because of contamination of soil and groundwater that resulted from past operations of the facility. Subsequently, the EPA, NYSDEC, and DOE entered into a Federal Facilities Agreement (herein referred to as the Interagency Agreement, IAG) that became effective in May 1992 (Administrative Docket Number: II-CERCLA-FFA-00201) to coordinate cleanup activities. The IAG identified areas of concern that were grouped into Operable Units (OUs) to be evaluated for response actions. The IAG requires a Remedial Investigation/Feasibility Study for OU V, pursuant to 42 U.S.C. 9601 et. seq., to meet CERCLA requirements. The IAG also requires cleanup actions to address the identified concerns. Cleanup at the BNL site will be conducted pursuant to CERCLA, 40 CFR Part 300.

BNL's Response Strategy Document (SAIC, 1992) grouped the identified areas of concern into seven Operable Units. OU II and VII were subsequently combined. Remedial investigations and risk assessments (OU V Remedial Investigation, IT Corporation 1998a, OU V Plutonium Contamination Characterization and Radiological Dose and Risk Assessment Report, IT Corporation 2000) for OU V were conducted. The remedial investigation included several additional studies such as a Toxicity Testing Study of the Peconic River sediment, an Acid Volatile Sulfide/Simultaneously Extracted Metals (AVS/SEM) study, and Fish Tissue Bioaccumulation Studies. The risk assessments that were conducted evaluated the nature and extent of contamination, and potential risks associated with the areas of concern that are addressed in this Record of Decision. A Feasibility Study (IT Corporation 1998b) was prepared to evaluate the alternatives for remediating the contaminated sediment in the Peconic River and soil in the STP sand filter beds and surrounding berms.

2.2 Site Description

OU V is located in the northeastern quadrant of the property along the eastern property border. The Response Strategy Document and the IAG designated the following AOCs and sub-AOCs for OU V:

AOC 4: Sewage Treatment Plant (STP)

- Sub-AOC 4A: Sludge Drying Beds
- Sub-AOC 4B: Sand Filter Beds
- Sub-AOC 4C: Imhoff Tank
- Sub-AOC 4D: Hold-up Ponds
- Sub-AOC 4E: Satellite Disposal Area

AOC 21: Sewer Lines within OU V

AOC 23: Eastern Off-site Tritium Plume

The STP is located adjacent to the Peconic River. Adjacent areas in Sub-AOC 4B include two areas immediately north and south of the sand filter beds and the BNL Firing Range berms. The sewer line runs from East Fifth Avenue to the STP [approximately 3,400 feet (1 kilometer)] and is currently retired and capped. The Eastern Off-site Tritium plume was so named because of an initial concern about tritium migrating off the BNL property in groundwater. However, further characterization showed no evidence of a defined tritium plume, and all observed tritium concentrations are well below the drinking-water standard of 20,000 pCi/L. Groundwater sampling during the remedial investigation also detected contamination of volatile organic compounds (VOCs), primarily trichloroethene (or trichloroethylene, TCE) both on and off the BNL property in the vicinity of the Sewage Treatment Plant.

An overview of the areas of concern addressed in this Record of Decision is presented below.

2.2.1 Sewage Treatment Plant

The sewage treatment plant now used by BNL was built in stages by the U.S. Army between 1940 and 1944, and was upgraded in 1967. An additional upgrade in 1997 converted the plant from primary to tertiary treatment. It is an active facility used to process sanitary sewage for BNL operations.

The Sewage Treatment Plant contained several sub-areas of concern: Sludge Drying Beds, Sand Filter Beds/Berms, Imhoff Tanks, Hold-up Ponds, and a Satellite Disposal Area. The Imhoff Tanks were addressed by a removal action in 1995-97, as described later in this section. Both soil and groundwater samples were collected during the OU V Remedial Investigation at the Hold-up Ponds and Satellite Disposal Area. No evidence of contamination warranting further action was found in any of these areas. Concentrations of heavy metals and radionuclides within the sludge drying beds and sand filter beds including surrounding berms do not pose risks to public health above levels acceptable to EPA. However, in order to minimize any potential sources that may slowly leach into the groundwater and the Peconic River, a localized removal of elevated levels of mercury and cesium-137 is being recommended for this area. Excavated wastes will be disposed of at a licensed off-site facility.

2.2.2 Other Areas of Concern

Operable Unit V contains two additional areas of concern: the Sewer Lines and the "Eastern Off-site Tritium Plume," an area of groundwater contamination.

Sewer Lines (AOC 21)

The original sewer line system at BNL was built by the U.S. Army in 1917 and was repaired and upgraded in 1942. In 1987, a section of pipe leading to the sewage treatment plant was found to be cracked and potentially leaking. This section of pipe was retired and capped in 1993.

Soil sampling was conducted during the Remedial Investigation in areas surrounding the sewer line that were suspected to have leaks. The results of the investigation identified only a few areas with low concentrations of inorganic constituents.

As part of a more recent investigation, sludge was collected from the bottom of manholes along the retired and capped sewer line and analyzed for radionuclides. The results of this investigation identified elevated activities of a few radionuclides. The current status of the sewer line (retired and capped at both ends) is such that no exposure pathway exists which could presently pose a risk to workers and the public. Removal of sludge from 10 manholes along the retired sewer line that lead to the STP will be performed. Institutional controls will prevent future excavation or damage to the buried sewer lines.

Eastern Off-site Tritium Plume (AOC 23)

In late 1984 and early 1985, groundwater monitoring was conducted in response to a release of wastewater containing tritium to BNL's sewage treatment plant. The highest concentration detected was 7,240 picoCuries per liter (pCi/l). This monitoring revealed the existence of elevated levels of tritium in the groundwater adjacent to the Lab's eastern boundary. Levels of tritium since that time have decreased and are now about 1/10 the drinking water standard of 20,000 pCi/l.

OU V groundwater monitoring also detected elevated levels of the organic chemical trichloroethylene, or TCE, near the Lab's eastern boundary both on and off site. The elevated levels of TCE are found at depths of approximately 200 feet. Homes and businesses in the OU V area were offered public water hookups in 1997 to protect against possible exposure to contaminated groundwater.

The recommended remedy for OU V groundwater is continued monitoring. Outpost monitoring wells have been placed along the predicted path of the groundwater. If future monitoring data suggest a need for a groundwater remedy, the OU V remedy will be modified.

Hold-up Ponds (Sub-AOC 4D)

Both soil and groundwater samples were collected in the area of the Hold-up Ponds during the investigations, and no evidence of leakage was found. No further action is required. These ponds will remain as part of the operating Sewage Treatment Plant. A groundwater monitoring network has been put in place as an institutional control, as part of the Lab's Groundwater Improvement Program (Phase II), to assure continued effectiveness of the Hold-up Ponds.

2.2.3 Removal Actions

From 1943 to 1967, BNL's sewage treatment plant employed two Imhoff Tanks for separation of solids from wastewater. In 1967, these tanks were taken out of service.

In 1995, the sludge remaining in these tanks was removed, packaged and shipped off site for disposal. The Imhoff Tank concrete structures were demolished in 1997. This removal action is being adopted, as the final action is this Record of Decision.

2.2.4 No Action Sub-AOCs

The OU V remedy also includes decisions to take no further action at several sub-AOCs, based on Remedial Investigation results.

Imhoff Tanks (Sub-AOC 4C)

The Remedial Investigation detected elevated levels of metals and low levels of radioactivity within the sludge collected at the bottom of the Imhoff Tanks. No leakage of contaminants from the Imhoff Tank to surrounding soil and groundwater was detected. In 1995, the sludge in the Imhoff Tank was removed and temporarily stored in above ground tanks until it could be treated. The sludge was dewatered, and the final waste transported to Envirocare in Utah in September 1996. The remaining Imhoff tank concrete structure was demolished, back-filled with clean fill, and capped with concrete. No further action is required for this sub-AOC.

Satellite Disposal Area (Sub-AOC 4E)

The soil and groundwater in the Satellite Disposal Area were thoroughly characterized and exploratory excavations were conducted. No evidence of contamination requiring further action was found. In 1985, bromine trifluoride cylinders and two boxes of laboratory chemicals were removed from this same area. No additional remediation is required for this area.

2.3 Level of Community Support for the Proposed Alternatives

During the ninety-day public comment period, hundreds of written comments were received on the OU V documents. The majority of the comments received was opposed to the plan of excavating areas of the Peconic River with sediment above cleanup goals and focused on minimizing wetland damage from the proposed excavation and sediment dispersion during remediation of the river sediment. There was also concern that the excavation process would disrupt the river's ecosystem and cause more damage than leaving the sediment in place.

The proposed remedy for the sewage treatment plant and groundwater was largely supported. There were no significant comments in opposition to the OUV remedial action for the Sewage Treatment Plant, groundwater, and sewer lines.

2.4 Changes in the Proposed Plan

Based on public and local official comments, as well as the EPA's and NYSDEC's recommendations, the Department of Energy will defer its decision on the cleanup of the Peconic River. A final remedy for the OU V Peconic River cleanup project will be selected after additional remedial action alternatives evaluation and community involvement has been completed. A new proposed plan for the OU V Peconic River will be prepared and a public comment period will be conducted in the future.

Changes in the Remedy Presented in the FS and PRAP

The following modifications were made to the preferred remedial alternative based on the concerns and input of the EPA and the New York State Department of Environmental Conservation after the public comment period in the spring of 2000.

The cleanup goal for cesium-137 was changed from 67 pCi/g to an average concentration of 23 pCi/g with hot spots no greater than three times the cleanup goal to allow greater flexibility in future land use. This change in cleanup goal did not alter the cost of remedy.

- Excavation and off-site disposal of soil above the cleanup goals will be performed at the Sludge Drying Beds. This additional work will involve a minimal cost increase.
- Sludge from ten manholes associated with the Sewer Lines (AOC 21) will be removed.

3. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

3.1 Community Profile

BNL is located in Brookhaven Town at the geographic center of Suffolk County, which encompasses the central and eastern part of Long Island. With a population of approximately 430,000, Brookhaven Town accounts for about sixteen percent of Long Island's 2.6 million residents. Suffolk County is operated by a county executive and an 18-member legislature. Brookhaven Town employs a town council (six at-large councilors) and a supervisor. Both governments maintain professional planning, development and environment departments, plus planning boards.

Many villages and hamlets dot Brookhaven Town's 370 square miles. The unincorporated communities of East Yaphank, Yaphank, Ridge, Middle Island, and Manorville surround BNL. Most of these villages and hamlets have citizen-run civic or taxpayer organizations with large and active memberships. Most organizations join one or both of the area's two umbrella civic groups, the Affiliated Brookhaven Civic Organization and the Longwood Alliance. These communities support service clubs, which represent the businesses, churches, and other aligned interests within the community.

The town of Riverhead is another Suffolk County town where BNL activities generate interest. It is located to the east of BNL, beyond the Town of Brookhaven, and has a population of about 23,800 and an area of about 80 square miles, of which about 40 percent is farmed. Riverhead employs a supervisor-town council government that maintains professional planning, development and environment departments, plus a planning board.

3.2 History of Community Involvement

Historically, public involvement in BNL's environmental restoration activities was low, but after the establishment of a Community Relations program in 1991, public interest and contact with BNL increased. Evidence of the growth of community involvement can be measured by the steady increase in the size of BNL's stakeholder mailing list, which currently numbers over 2,500. BNL has made concerted efforts to inform and involve the community in its remediation efforts, and OU V has been routinely included in community involvement efforts.

On March 1, 1998, Brookhaven Science Associates became the management group responsible for BNL. Since then, interaction with the community has been a major focus of BNL's administration and employees.

Two established mechanisms for community involvement are consistently updated through routine meetings at BNL. The Brookhaven Executive Roundtable (BER) (established in August 1997) is composed of elected officials (or their representatives), regulators, and the Suffolk County Water Authority. Community members routinely attend the meetings and an opportunity for public comment is always on the agenda. The BER was created to facilitate and expedite the flow of information from BNL to some of its key stakeholders on significant environmental, operational and/or regulatory/oversight issues. An independent Community Advisory Council (CAC) has been meeting since September 1998. Composed of representatives of established stakeholder groups on Long Island, BNL employees and several individuals, the council meets to learn about and discuss issues relating to the laboratory and to offer recommendations to BNL's director.

Regular communication with stakeholders about BNL cleanup activities is maintained through the production and distribution of the *cleanupupdate* newsletter. Publication of this quarterly newsletter began in early 1996. It is currently distributed to more than 5,000 BNL employees and retirees, as well as more than 2,500 households on the ERD mailing list.

Community relations activities concerning OU V have echoed the new emphasis on community involvement at the decision-making level. Since August 1998, ten roundtables and workshops have been conducted to solicit community input on systems at BNL and Peconic River sampling strategies before the final remedies or plans were selected by BNL.

Additionally, in March 2000, a Peconic River & Bay Workshop was held to bring together groups with a mutual interest in protecting the Peconic. Speakers included staff from the Cornell Cooperative Extension, the Suffolk County Office of Ecology, and BNL's Environmental Restoration Division. Several tours of the areas proposed for cleanup in the Peconic River were conducted for those interested.

The goals of the Community Relations program are the following:

- To inform stakeholders (on-site employees and members of the public) about the issues being addressed.
- To solicit input from stakeholders about these issues.
- To provide stakeholder input to DOE/BNL senior management and regulators to be used as one of the decision-making criteria for evaluating cleanup alternatives.
- To develop relationships with on-site employees, community members and leaders, and community environmental activists.
- To increase regular communication with stakeholders through expansion of the BNL stakeholder mailing list.

A Community Relations Plan was finalized for the BNL site in September 1991. In accordance with this plan and CERCLA Section 113 (k) (2)(B)(I-v) and 117, the community relations program focused on public information and involvement. A variety of activities were used to provide information and to seek public participation, including the following:

- The compilation of a stakeholder mailing list
- The regular issuance of the newsletter *cleanupupdate*.
- Meetings held with stakeholders in the form of roundtables, workshops, public meetings or individual stakeholder contacts.
- Maintenance of the ERD home page on the internet.
- Attendance at and updates provided to civic organization monthly meetings.
- Mailings of fact sheets about specific projects.
- An Administrative Record, documenting the basis for the selection of removal and remedial actions at the BNL site, has been established and is maintained at the local libraries listed below:

Longwood Public Library
800 Middle Country Road
Middle Island, NY 11953

Mastics-Moriches-Shirley Library
301 William Floyd Parkway
Shirley, NY 11967

Brookhaven National Laboratory Research Library
Bldg. 477A
Upton, NY 11973

EPA Region II
Administrative Records Room
290 Broadway
New York, NY 10001

3.3 Summary of Community Participation Activities for OU V

Listed below are the major areas of community relations activities relating to the remedial activities that are covered by the OU V Feasibility Study and the Proposed Plan. Section 5 provides a detailed chronology of all the community relations activities for OU V.

Remedial Investigation/Feasibility Study Work Plan

The *Operable Unit V Remedial Investigation/Feasibility Study Work Plan*, *Operable Unit V Health and Safety Plan* for the RI/FS and *Operable Unit V Sampling and Analysis Plan* for the RI/FS were placed in the Administrative Record on October 14, 1994. A public notice of availability for review and comment of these reports was published in *Newsday* and *Suffolk Life* on October 17 and October 19, 1994, respectively. A letter announcing the availability of these three reports was sent to the community relations mailing list on October 14, 1994. This mailing included a four-page fact sheet, a copy of the public notice, and an announcement of the upcoming public meeting. A public meeting on Operable Unit V, attended by 32 local residents, was held on November 9, 1994.

Imhoff Tanks Closeout Report

The "Operable Unit V Imhoff Tank Closeout Report" was placed into the Administrative Record in May 1997. The completion of this cleanup was announced in a *cleanupupdate* article in July 1997, titled "Cleanup of sewage tanks complete; report available."

Operable Unit V Remedial Investigation Report

Community members and regulators were kept informed on the progress of the OU V remedial investigation throughout the sampling program. On February 29, 1996, the Community Work Group (an independent citizen group which looked into operations at BNL during 1996) was updated on OU V activities.

Presentations, updates and briefings were offered throughout 1997, to groups including the Suffolk County Task Force, the Suffolk County Energy and Environment Committee, the Brookhaven Executive Roundtable, and the BNL Oversight Committee. Details are provided in section 5.

On January 23-24, 1998, Laboratory representatives attended the Fisherman's Forum at the Riverhead campus of Suffolk County Community College. On February 11, the Laboratory sponsored a Peconic River & Bay Workshop. Additionally, on February 18, representatives of the Laboratory and the Department of Energy met with the Suffolk County Department of Health Services (SCDHS) and Fish Unlimited to discuss results of the Independent Sampling Program.

The *cleanupupdate* newsletter gave regular updates on OU V during the investigation. In the September 1997 issue, an article was published titled "Stakeholders' input key to determining Peconic area cleanup." The November 1997 issue contained the articles "River testing underway," "Peconic River report expected; sampling project underway," and "Completed projects adding up as Lab cleanup moves forward." The last article gave an update on the dismantlement of the Imhoff Tanks at BNL's sewage treatment plant. In May 1998, two articles on OU V were published, titled "Independent sampling complete" and "Peconic River report due out May 27; public input sought."

On May 26, 1998, a letter was sent to the community relations mailing list (approximately 2,000 people at that time), announcing the availability of the *OU V Remedial Investigation Report*. A fact sheet and a copy of the public notice were included in the mailing. Also on May 26, a press release titled "DOE Seeks Public Comment - BNL Releases Results of Peconic River Area Investigation" was issued announcing the release of the OU V RI/RA. The OU V RI/RA was placed into the Administrative Record on May 27, 1998. A public notice announcing the availability of this report for public review and comment was published in *Newsday* and *Suffolk Life*.

OU V Plutonium Contamination Characterization Sampling and Analysis Plan

On June 10, 1998, a press release titled "Brookhaven Lab Tests Show Low Levels of Plutonium in Sediment" was issued announcing the presence of plutonium in Peconic River

sediment. Also on June 10, approximately 40 key stakeholders were called to inform them of the results described in the press release. Twelve homes and one business along the Peconic River, within one mile of BNL, were canvassed for the same reason. Between June and August 1998, briefings were given to numerous civic associations, local businesses and individual residents, as well as the Brookhaven Executive Roundtable.

During 1998, planning began for additional sampling of the Peconic River. An article was published in the August 1998 *cleanup* titled "More Peconic Sampling Planned." In October, five roundtable sessions were held to gather community input on the proposed plutonium sampling plan. Thirty-one members of the local community and eleven Laboratory employees attended one or more of these meetings. On November 17, the Brookhaven Executive Roundtable was updated on these outreach activities and the sampling plan. The December 1998 *cleanup* reported on these meetings in "Roundtables help focus Peconic River sampling plan."

In January 1999, BNL representatives attended the Fisherman's Forum in Riverhead and discussed Laboratory activities with about 52 community members. In February, a meeting was held with representatives of Riverhead Town to discuss their questions about the Peconic River sampling. On February 9, the Laboratory sponsored a Peconic River & Bay Workshop. On February 23, the Brookhaven Executive Roundtable was advised that the sampling plan would be finalized and sampling would begin shortly.

On March 15-16, 1999, the "Operable Unit V Plutonium Contamination Characterization Sampling and Analysis Plan" was placed into the Administrative Record for public review. A letter was sent to those who had participated in the roundtable meetings in the fall of 1998, informing them that the sampling plan was available and that sampling would begin shortly.

On March 18, SCDHS and Suffolk County Community Oversight Committee representatives were briefed on the plutonium sampling plan. They were also given a tour of Peconic River sampling stations to assist their selection of stations for splitting samples with BNL. On March 23, the Brookhaven Executive Roundtable was updated on the OU V project.

OU V Plutonium Contamination Characterization and Radiological Dose and Risk Assessment Report

BNL began additional sampling for plutonium on March 25, 1999. In April, the start of sampling activities was announced at several local civic organizations. Also, 33 homes near the Peconic River were canvassed to discuss the sampling program. Over 300 pre-canvassing letters were mailed to residents and businesses located along the Peconic River.

The additional sampling was completed on April 30. This completion was announced in May at eleven local civic organizations. The June 1999 *cleanup* carried an article titled "Peconic sampling completed."

On October 12, 1999, a press conference was held to announce the results of the 1999 Peconic River sampling. Prior to the press conference, a number of key stakeholders were

contacted by phone to inform them of the results. A press release was issued titled "Brookhaven Lab Reports Peconic River Sampling Results." Between October 11-15, eighteen homes and businesses located near BNL along the Peconic River were visited to inform them of the results of the latest sampling. Brochures were left for those not at home.

On October 14, a brochure announcing the results of the plutonium sampling was mailed to approximately 2,500 individuals on the community relations mailing list, and was distributed to all BNL employees. The brochure was placed online at the ERD web site on October 21. This brochure was also distributed at the regular meetings of local civic organizations in November.

Information sessions announcing the results of the Peconic River sampling were held on October 14, 19 and 21. The information session on the 14th was followed by a presentation to the Community Advisory Council. Information was also available at the 1999 Festival of Science and the Environment, held at BNL on October 16 and attended by approximately 3,600 people. Prior to these meetings, advertisements announcing them were placed in the Riverhead News Review, Suffolk Life, and Newsday. On October 27, Operable Unit V Project Managers met with the Suffolk County Community Oversight Committee to review the results of the plutonium sampling. The Brookhaven Executive Roundtable was also briefed on the sampling results.

On January 13, 2000, the Community Advisory Council was informed of the expected schedule for the release of the plutonium sampling results report. The *Plutonium Contamination Characterization and Radiological Dose and Risk Assessment Report* was placed into the Administrative Record on February 3. Public notices announcing its availability were published in Newsday and Suffolk Life on February 7 and 9, respectively.

Operable Unit V Feasibility Study Report and Proposed Plan

The *Operable Unit V Feasibility Study Report* was placed into the Administrative Record on November 1, 1999. The Executive Summary of this report was placed online at the ERD web site on the same day. Public notices announcing the availability of the OU V Feasibility Study Report were published in Newsday and Suffolk Life on November 10 and 17, respectively. The December 1999 *cleanupupdate* carried the article "Peconic testing complete, cleanup options offered."

In November and December 1999, the Community Advisory Council and the Brookhaven Executive Roundtable were briefed on cleanup alternatives for BNL's sewage treatment plant and Peconic River sediment. In January 2000, Laboratory representatives attended the Fisherman's Forum in Riverhead and discussed BNL activities with approximately 20 people.

The *Operable Unit V Proposed Remedial Action Plan* was placed into the Administrative Record on February 15, 2000. An 8-page fact sheet summarizing the plan was mailed to approximately 2,500 individuals on the Community Involvement mailing list on February 16. The proposed plan and fact sheet were placed online at the ERD web site on February 15.

Two roundtable meetings to discuss the proposed remedy were held on February 23rd and 29th at BNL and Riverhead High School, respectively. Over 30 members of the community attended these two meetings. A public meeting, attended by approximately 40 people, was held on March 2, 2000 at BNL. Written comments from the public were solicited and received at all three meetings, and oral comments were recorded and a transcript prepared for the March 2 meeting. On April 24, questions and answers from these two meetings were mailed to all 30 roundtable attendees. At the Peconic River & Bay Workshop on March 7, participants were informed about the proposed remedy and taken on a tour of the Peconic River locations proposed for remediation.

At the February 29 roundtable meeting, a 60-day extension of the public comment period was announced. This extension was also announced in advertisements published in *Newsday* and *Suffolk Life* on March 13 and 15, respectively. Community members were also informed of the extension at the April meetings of 11 local civic organizations.

On March 8, the OU V project manager met with representatives of the Peconic Rod and Gun Club to discuss the results of independent sampling they had conducted of Peconic River sediment. On April 11 and 13, tours of areas proposed for remediation were provided to the community and representatives of NYSDEC and the Pine Barrens Society. The OU V project was also discussed at the April 13 and May 11 meetings of the Community Advisory Council.

The April 2000 *cleanup update* included the articles "Department of Energy seeks input on Peconic River/Sewage Treatment Plant cleanup," "Laboratory sample results confirmed," and "Preserving the Peconic - a cooperative effort." This last article discussed the March Peconic River & Bay Workshop.

OU V project members continued to keep the public informed by offering presentations on the proposed remedy at the April 16 meeting of the East Yaphank Civic Association and the May 4 Manorville Taxpayers Association meeting. BNL representatives also attended a special hearing of the Suffolk County Energy and Environment Committee on May 5 to present information on this project.

On June 2, a letter summarizing BNL's path forward for OU V was mailed to approximately 2,500 people on the Community Relations mailing list.

4.0 COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, AND CONCERNS AND DOE RESPONSES

4.1 Overview

Written comments and questions on the preferred remedy for the Operable Unit V Sewage Treatment Plant, sewer lines, and groundwater received during the public comment period, and oral comments made during the public meeting, are summarized and addressed below. Some written questions and comments were received, and others were made during the public meetings, that did not relate to the proposed cleanup action that is the subject of this Record of Decision. These comments were addressed by the panel at the public meeting, and/or

are being followed up through other community relations activities. Only those questions and comments directly related to the OU V proposed remedial action for the Sewage Treatment Plant, groundwater, and sewer lines are addressed in this Responsiveness Summary.

The format of this Responsiveness Summary combines similar questions or comments from different sources for a common response. A copy of the transcript of the public meeting is available in the Administrative Record.

4.2 Summary and Response to Questions and Comments

General Topics

1. Public Outreach
2. Proposed Cleanup Remedies
3. Human Risk Assessment
4. Cleanup Goals (Objectives)

Questions and Comments

1. Public Outreach

There is a feeling that the process is being driven by BNL and DOE with very little input from the community.

Response: A variety of activities were used to provide information and to seek public participation and input relative to Operable Unit V. These activities included: the compilation of a stakeholder mailing list; the regular issuance of the newsletter *cleanupdate*; meetings held with stakeholders in the form of roundtables, workshops, public meetings or individual stakeholder contacts; maintenance of the ERD home page on the internet; attendance at and updates provided to civic organization monthly meetings; mailings of fact sheets about specific projects; and placing all primary documents in the Administrative Record for review and comment by the community. More details of the background on community involvement and concerns and a chronology of community relations activities associated with Operable Unit V can be found in sections 3.0 and 5.0 of this Responsiveness Summary.

2. Proposed Cleanup Remedies

2a. I support your proposals for the sewage treatment plant, sewer lines, and groundwater of Operable Unit 5. I think you need to be very careful when you address the Peconic River. The desire to remove contaminated sediments should be carefully weighed against the potential for damage and destruction of wetlands. Even with reconstruction, it could take years for the river to recover. I support the excavation and disposal of contaminated sediments. However, I recommend that you limit the excavation as much as possible, to only the areas that really need it. Set the cleanup goals as high as you can while still protecting wildlife and the environment.

Response: Comment acknowledged.

2b. Your comprehensive studies of the polluted areas at BNL are quite impressive. It's too bad this was not done earlier, but I am in total agreement with your proposed remedies. I think the general public appreciates the tremendous efforts taken at BNL to make this operation 100% safe. I fully support your proposed future actions both as a former employee and a private citizen. An "open house" to the general public might be a good idea to make known to your neighbors of your proposed future "clean up" actions.

Response: A variety of activities were used to provide information to the public on the proposed future cleanup actions and to seek their participation, including compilation of a stakeholders mailing list, community meetings, availability sessions, site tours, workshops, and the development of fact sheets. A public comment period for the review of the OU V Proposed Plan began on February 15, 2000 and a public meeting was held on March 2, 2000 at Brookhaven National Laboratory. DOE granted a 60-day extension and the comment period ended on May 15, 2000. There will be several additional opportunities for public interaction during future Operable Unit V activities.

2c. First, and for the record, I take exception to the statement under the subheading 'Groundwater' under the section named 'Remedial Investigation Summary'. "The elevated levels of TCE in groundwater off site were found at depths (200 feet) below the depths at which residential wells are typically screened, and public exposure to TCE in groundwater is unlikely." My potable water supply well was screened at 200 feet, and my family had been exposed to TCE exceeding current drinking water standards for over 7 years. In fact, it was the discovery of TCE in my well which prompted this aspect of the OU V investigation.

Response: Agreed. One residential well in the Operable Unit V area was screened at approximately 200 feet. The resident's well was impacted with TCE at levels greater than the drinking water standard. The resident was provided with a carbon filter and subsequently provided with public drinking water. Future exposure to elevated TCE in drinking water is not anticipated for this resident.

3. Human Risk Assessment

3a. Who prepares the human and ecological health risk assessments?

Response: IT Corporation, Inc. was contracted by Brookhaven National Laboratory to perform the human health and ecological risk assessments for Operable Unit V. The procedures and methodologies used in the risk assessments follow those developed by the U. S. Environmental Protection Agency (EPA), the New York State Department of Environmental Conservation (NYSDEC), and the New York State Department of Health (NYSDH). These agencies also reviewed these assessments.

3b. Who decides if there is a human health risk?

Response: Ultimately, the regulatory agencies (i.e. EPA, NYSDEC, and NYSDOH) determine whether there is a human health risk based on the results of the site-specific risk assessment. The

EPA has a documented methodology for assessing human health risks at CERCLA sites no matter the type of contamination. This methodology can be found in the *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual-Part A* (USEPA, 1989).

3c. Are synergistic effects accounted for in the human health risk assessment?

Response: The issue of synergistic effects is a complex one. The Laboratory and the regulatory agencies recognize the possibility of synergistic effects, but data to develop regulations on the basis of potential synergism is currently lacking. This is compensated for through the use of very conservative assumptions when developing risk assessments.

3d. Concern was expressed that all risks to exposed populations (specifically off-site residents) were not identified in the human health risk assessment.

Response: A number of environmental medium-specific exposure pathways exist that may contribute to the cumulative dose of constituents that a potentially exposed population could receive on or off the BNL property. The human health risk assessment performed for OU V evaluated the four elements necessary to indicate potential exposure of a population: a source and mechanism of release, a mechanism of transfer of contaminants among environmental media, a point of potential contact of humans to the contaminated medium, and an identified route of exposure. Based on this evaluation, eight (8) environmental medium exposure-related pathways were identified and evaluated in the resident exposure assessments:

- inhalation of soil particulates and dusts;
- incidental ingestion of soil/sediment;
- external gamma exposure from radionuclides in soil;
- incidental ingestion of sediment through recreational activities;
- ingestion of groundwater as the drinking water source;
- dietary consumption of home-grown fruits and vegetables at approximately 30-40 percent of the annual intake;
- incidental ingestion of surface water through recreational activities; and
- ingestion of contaminated fish.

It is important to note that an identified pathway indicates the potential for exposure; it does not imply that exposures are or may actually occur. The list of exposure pathways identified for Operable Unit V supports a robust calculation of potential risks to the exposed population.

4. Cleanup Goals

What is the source of the cleanup goals?

Response: The cleanup goal for mercury at the sewage treatment plant is from EPA guidance and is based on a cleanup goal derived for the protection of groundwater. This cleanup goal is more stringent than the cleanup goal for direct contact with mercury-contaminated soil and, therefore, is protective of human health for trespassers, as well as potential groundwater consumers.

The cleanup goal for cesium-137 at the Sewage Treatment Plant was calculated using the DOE Residual Radioactive Material Guidelines (RESRAD) computer code and is based on the following:

- A total dose limit of 15 mrem/yr above background ;
- Assuming a future residential land use; and
- 50 years of institutional control of the area and five-year reviews.

Based on this information, the cleanup goal within the affected areas of the sewage treatment plant will be such that the remaining average concentration for cesium-137 will be less than 23 pCi/g. A hot spot criterion of three times the cleanup goal of 23 pCi/g will be applied. Contaminant concentrations above this criterion would be removed even if the average concentration were less than the 23 pCi/g. This cleanup goal allows for current industrial and future residential land use after the assumed 50-year period of institutional control.

5.0 CHRONOLOGY OF COMMUNITY RELATIONS ACTIVITIES

Following is a chronology of general and OU V focused community relations activities at BNL.

1994

- | | |
|-----------------------------|---|
| October 7 | A press release was issued announcing the upcoming release of the "Operable Unit V Remedial Investigation/ Feasibility Study (RI/FS) Work Plans." It also gave the time and location of the public meeting to discuss these plans. |
| October 14 | A letter was sent to the community relations mailing list announcing the availability of the RI/FS Work Plans. It included a four-page fact sheet, a copy of the legal notice, and an announcement of the public meeting on November 9. |
| October 14 -
November 14 | The public comment period for the RI/FS Work Plans was held. A public notice announcing the availability of this document for review and comment was published in Newsday and Suffolk Life on October 17 and 19, respectively. |
| November 9 | A public meeting was held at BNL to discuss the RI/FS Work Plans and |

their findings. A total of 32 local residents attended this meeting. A tour of the Lab's sewage treatment plant was offered prior to the meeting.

1995

- Monthly Briefings on project activities were given to 13 local civic organizations. Community relations personnel responded to questions from the community on Operable Unit V project activities.
- November 28 A presentation on the sewage treatment plant upgrade was given to key stakeholders and elected officials.

1996

- February 29 A presentation was given to the Community Work Group on the sewage treatment plant upgrades and on Operable Unit V project activities.
- May 14 The Community Work Group was updated on Environmental Restoration Division activities.
- Winter The following article was published in the newsletter *cleanupdate*, which is mailed to the stakeholders, all BNL employees, and to BNL retirees: "Equal parts expertise and patience key to restoration"

1997

- January - April Operable Unit V project members responded to Suffolk County Task Force requests for information regarding Operable Unit V.
- April 7 A presentation was given to the Suffolk County Task Force on the Peconic River contaminants, sewage treatment plant discharges, and status of on-site and off-site sediment data.
- May The "Operable Unit V Imhoff Tank Closeout Report" was issued.
- July The following article was published in the newsletter *cleanupdate*, which is mailed to the stakeholders, all BNL employees, and to BNL retirees: "Cleanup of sewage tanks complete; report available"
- August 25 Technical data was presented to the Brookhaven Executive Roundtable.
- August - November Briefings on Operable Unit V were given to elected officials.
- September 5 New York State Dept. of Environmental Conservation (NYSDEC) representatives were briefed on Operable Unit V.

- September 9 Suffolk County Dept. of Health Services (SCDHS) representatives were briefed on Operable Unit V.
- September 18 A presentation was given to the Technical Advisory Committee and the Citizens Advisory Committee of the Peconic Estuary Program.
- September 24 NYS Attorney General Vacco was briefed on OU V issues.
- September 30 A presentation on OU V was given to the Suffolk County Energy and Environment Committee.
- September The following articles were published in the newsletter *cleanupupdate*, which is mailed to the stakeholders, all BNL employees, and to BNL retirees:
 "Summer projects set stage for fall"
 "Stakeholders' input key to determining Peconic area cleanup"
 "Solvents are key concern in aquifer"
- October 6 A briefing on OU V was given to the Brookhaven Executive Roundtable.
- October 16 A presentation on OU V was given to the SCDHS and the BNL Oversight Committee. A tour of the sewage treatment plant was given to Independent Sampling Program representatives.
- October 21 - 22 Peconic River tours were given to U.S. Environmental Protection Agency (EPA) Biological Technical Advisory Group and Independent Sampling Program representatives.
- October 28 A presentation was given to the East End Surf Fishing Club regarding contaminant levels in the Peconic River.
- November 6 A presentation was given to the Manorville Taxpayers Association regarding Operable Unit V off-site groundwater issues.
- November 13 A briefing was given to Interagency Agreement project managers and NYSDEC representatives regarding Peconic River fish studies.
- November The following articles were published in the newsletter *cleanupupdate*, which is mailed to the stakeholders, all BNL employees, and to BNL retirees:
 "River testing underway"
 "Peconic River report expected, sampling project underway"
 "Completed projects adding up as Lab cleanup moves forward"

1998

January 23 - 24 BNL representatives attended the Fisherman's Forum at the Riverhead campus of Suffolk County Community College.

February 11 The Laboratory sponsored a Peconic River & Bay Workshop held at BNL's Berkner Hall. The division manager gave a general presentation and tour.

February 18 A meeting was held with SCDHS, Fish Unlimited, DOE and ERD in Hauppauge to discuss independent sampling results.

May The following articles were published in the newsletter *cleanupupdate*, which is mailed to the stakeholders, all BNL employees, and to BNL retirees:
 "Peconic River report due out May 27; public input sought"
 "Independent sampling complete"

May 26 A letter was sent to the community relations mailing list (approximately 2,000 listings), announcing the availability of the "Operable Unit V Remedial Investigation/Risk Assessment (OU V RI/RA) Report." A copy of the public notice and a fact sheet were included in the mailing.

May 26 A press release was issued announcing the release of the OU V RI/RA.

May 27 The OU V RI/RA was placed into the Administrative Record. A public notice announcing the availability of this report for review and comment was published in Newsday and Suffolk Life.

June 10 A press release was issued announcing the presence of plutonium in Peconic River sediment.

June 10 Key stakeholders (approximately 40 organizations and individuals) were called to inform them of the results described in the press release on plutonium in sediments. Twelve homes and one business along the Peconic River, within one mile of BNL, were canvassed to inform them of the plutonium results.

June 11 Initiated calls to community organizations to begin scheduling presentations/briefings on the plutonium issue.

June 15 - 24 Briefings given to Affiliated Brookhaven Civic Organization, Mastic Beach Civic Association, Ridge Civic Association, Middle Island Civic Association, Wading River Civic Association on the plutonium issue.

June 23 The Brookhaven Executive Roundtable was given an overview of

plutonium and its historical sources at the Lab and was briefed on the most recent sediment analysis and the results of the preliminary data.

- July 21 The Brookhaven Executive Roundtable was updated on the supplemental sampling of Peconic River sediments for plutonium.
- August Briefing given to Lake Panamoka Civic Association on the plutonium issue.
- Ongoing One-on-one briefings to community residents and local businesses; small group meetings scheduled as requested.
- August The following article was published in the newsletter *cleanupdate*, which is mailed to the stakeholders, all BNL employees, and to BNL retirees: "More Peconic sampling planned"
- October Five roundtable sessions were held to gather community input on the proposed plutonium sampling plan. Thirty-one members of the local community and eleven Laboratory employees attended one of these meetings. Comments from these roundtable meetings were collected and incorporated into the final "Plutonium Contamination Characterization Sampling and Analysis Plan" to the extent possible.
- November 17 The Brookhaven Executive Roundtable was updated on the draft Peconic River sampling plan and associated community outreach activities.
- December The following article was published in the newsletter *cleanupdate*, which is mailed to the stakeholders, all BNL employees, and to BNL retirees: "Roundtables help focus Peconic River sampling plan"
- December 10 The Community Advisory Council was briefed on the OU V remedial investigation and the supplemental Peconic River sampling to take place in 1999.
- 1999**
- January 20 The Brookhaven Executive Roundtable was updated on Operable Unit V and the Peconic River plutonium sampling plan.
- January 22, 23 BNL representatives attended the Fisherman's Forum at the Riverhead campus of Suffolk County Community College. A sign-up sheet for the upcoming Peconic River & Bay Workshop was available, as well as issues of the December 1998 *cleanupdate*. Approximately 52 people visited the BNL booth.

February 9	The Laboratory sponsored a Peconic River & Bay Workshop held at BNL's Berkner Hall.
February 23	The Brookhaven Executive Roundtable was advised that the plutonium contamination characterization sampling plan was being reviewed by regulators and that sampling was expected to start in March 1999.
February	A plan for community involvement activities related to the "Operable Unit V Plutonium Contamination Characterization Sampling and Analysis Plan" was prepared.
February	A meeting was held with representatives of Riverhead Town to discuss their questions about the Peconic River sampling.
March 15-16	The "Operable Unit V Plutonium Contamination Characterization Sampling and Analysis Plan" was placed into the Administrative Record for public review. A letter was sent to those who participated in the roundtable meetings in the fall of 1998, informing them that the sampling plan was available and that sampling would begin shortly.
March 18	Suffolk County Department of Health Services and Suffolk County Community Oversight Committee representatives were briefed on the "Operable Unit V Plutonium Contamination Characterization Sampling and Analysis Plan." They were also given a tour of Peconic River sampling stations to assist their selection of stations for splitting samples with BNL.
March 23	The Brookhaven Executive Roundtable was updated on the status of the Operable Unit V project.
March 25- April 30	BNL sampled for plutonium characterization. Representatives of the New York State Department of Environmental Conservation, Suffolk County Department of Health Services, Suffolk County Community Oversight Committee, and the Town of Riverhead observed various sampling activities.
April	The beginning of sampling activities was announced at several local civic organizations.
April	33 homes near the Peconic River were canvassed to discuss the sampling program. Over 300 pre-canvassing letters were mailed to residents and businesses located along the Peconic River.
May	The completion of plutonium characterization sampling was announced

at local civic organizations.

- May A plan for community involvement activities related to communicating the results of the Peconic River sampling was prepared.
- June The following article was published in the newsletter *cleanupupdate*, which is mailed to the stakeholders, all BNL employees, and to BNL retirees: "Peconic sampling completed"
- July 22 BNL representatives attended a meeting at Stony Brook with the DEC Fisheries Manager, Peconic Bay Keeper, and a representative of SCDHS to discuss Peconic River fish sampling to be performed by DEC for SCDHS as part of the county's plutonium sampling program.
- October 11-15 Eighteen homes and businesses located near BNL along the Peconic River were visited to inform them of the results of the 1999 Peconic River sampling. Brochures were left for those not at home.
- October 12 A press conference was held to announce the results of the 1999 Peconic River sampling. Prior to the press conference, the following groups/ individuals were contacted by phone: Community Advisory Council (CAC) members, Brookhaven Executive Roundtable members, local civic organizations, Operable Unit V roundtable participants, the Riverhead, Easthampton, and Southampton Town Supervisors, other elected officials, and a representative of the NAACP. Those with fax machines were also faxed a copy of the associated press release.
- October 14 An information session was held prior to a meeting of the CAC, giving the results of the 1999 Peconic River sampling. People who attended the Peconic River roundtables in late 1998, members of the CAC, and BNL employees were invited to this information session. The Operable Unit V Project Manager gave a presentation on the sampling results to the CAC.
- October 14 A brochure about the results of the 1999 Peconic River sampling was mailed to 2,500 homes on the BNL Community Relations mailing list, as well as 2,000 BNL retirees, and distributed to all BNL employees (>3,000).
- October 16 Information on the 1999 Peconic River sampling was provided to people attending BNL's Festival of Science and the Environment. Over 3,600 people attended this festival.
- October 18 Notice of the upcoming Peconic River information sessions was placed onto the BNL Environmental Restoration Division web site.

October 19, 21 Information sessions on the 1999 Peconic River sampling were held at Riverhead High School (10/19/99) and Riverhead Middle School (10/21/99). A total of 14 community members attended these two information sessions. Prior to these meetings, advertisements announcing them were placed in the Riverhead News Review, Suffolk Life, and Newsday.

October 21 The brochure describing the Peconic River sampling results was placed online at the BNL Environmental Restoration Division web site.

October 27 Operable Unit V project members met with the Suffolk County Community Oversight Committee to review the results of the plutonium sampling. The Brookhaven Executive Roundtable was also briefed on the sampling results. Project managers also met with representatives from Standing for Truth About Radiation (STAR) to discuss the draft plutonium report describing sampling results.

November The Peconic River sampling results brochure was distributed at the regular meetings of 11 local civic organizations.

November 1 The "Operable Unit V Feasibility Study Report" was placed into the Administrative Record. The Executive Summary of this report was placed online at the BNL Environmental Restoration Division web site. Public notices announcing the availability of this report were published in Newsday and Suffolk Life on November 10th and 17th, respectively.

November 18 The Operable Unit V project manager briefed the Community Advisory Council on soil cleanup alternatives at BNL's sewage treatment plant.

November 19 The local NYS Department of Environmental Conservation Fisheries and Community Participation staffs were briefed on the Peconic River plutonium investigation.

December 8 The Brookhaven Executive Roundtable was briefed on the proposed remedial actions for BNL sewage treatment plant soil and Peconic River sediment.

December 9 The Community Advisory Council was briefed on the proposed remedial actions for BNL sewage treatment plant soil and Peconic River sediment.

December The following article was published in the newsletter *cleanupdate*, which is mailed to the stakeholders, all BNL employees, and to BNL retirees: "Peconic testing complete, cleanup options offered"

2000

- January 13 The Community Advisory Council was briefed on the expected schedule for the release of the "Plutonium Contamination Characterization and Radiological Dose and Risk Assessment Report."
- January 21-2 Attended the Fisherman's Forum at SCCC-Riverhead campus. Answered questions and discussed BNL activities with approximately 20 people.
- February 3 "Plutonium Contamination Characterization and Radiological Dose and Risk Assessment Report" released to the public. This report gave results of the 1999 sampling for plutonium and related radionuclides. Its availability was announced with a public notice in Newsday and Suffolk Life on February 7 and 9, respectively.
- February 15 The "Operable Unit V Proposed Plan" was released to the public. An 8-page fact sheet summarizing the plan was mailed to approximately 2,500 individuals on the Community Involvement mailing list on February 16. The proposed plan and fact sheet were placed online at the ERD web site on February 15.
- February 15 - May 15 Public comment period for the "Operable Unit V Proposed Plan." Several hundred written comments were received during this time.
- February 16 Project manager met with a representative from Riverhead to discuss the proposed cleanup plan.
- February 23 First roundtable meeting on the "OU V Proposed Plan," attended by 19 members of the public, was held at BNL.
- February 24 A presentation on the proposed cleanup plan was given to BNL envoys.
- February 29 Second roundtable meeting on the "OU V Proposed Plan," attended by 11 members of the public, was held at Riverhead High School. At this roundtable, the extension of the OU V public comment period through May 15 was announced.
- March 2 A public meeting on the "OU V Proposed Plan," attended by approximately 40 people including 18 members of the public, was held at BNL.
- March 7 Information on the "OU V Proposed Plan" was presented at the Peconic River and Bay Workshop at BNL. Following the workshop, interested community members were given a tour of the Peconic River locations proposed for remediation.

- March 8 OU V project manager met with representatives of the Peconic Rod and Gun Club to discuss the results of independent sampling they had conducted of a portion of the Peconic River.
- March 13, 15 Advertisements published in Newsday and Suffolk Life, respectively, announcing the extension of the public comment period.
- March 22 OU V project manager held a follow-up meeting with BNL envoys to answer their questions about OU V.
- April The extension of the public comment period was announced to 11 local civic organizations at their regular meetings.
- April 11 Tour of areas proposed for remediation provided to interested community members.
- April 13 Provided tour of areas proposed for remediation to NY State Dept. of Environmental Conservation representatives and a representative of the Pine Barrens Society.

the hearing.

May 11

OU V project members attended the Community Advisory Council meeting to answer questions if needed. The CAC subcommittee on OU V presented their final recommendation for the OU V remedy.

June 2

A letter summarizing BNL's path forward for OU V was mailed to approximately 2,500 people on the Community Relations mailing list.

6.0 REFERENCES

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